



COMMUNITY HEALTH CELL
326, V Main, I Block
Koramangala
Bangalore-560034
India

REFRESHER COURSE FOR
PLANTATION MEDICAL OFFICERS

APR 110
1141

THE UNITED PLANTERS' ASSOCIATION OF SOUTHERN INDIA

Glenview

COONOR-643 101

Nilgiris

113411

Community Health Cell

Library and Information Centre

359, "Srinivasa Nilaya"

Jakkasandra 1st Main,

1st Block, Koramangala,

BANGALORE - 560 034.

Ph : 2553 15 18 / 2552 5372

e-mail : chc@sochara.org

COMMUNITY HEALTH CELL

~~47/1 St. Mark's Road, Bangalore - 560 004~~

REFRESHER COURSE FOR PLANTATION MEDICAL OFFICERS

CONTENTS

	Page No.
Preface	
Inaugural Address by Mr. K. B. Somana, President, UPASI	1
Welcome Address by Maj. Gen. B. Mahadevan	7
Historical Development of Medical Services in Plantations	14
Evaluation of Health Programmes by Dr. M. I. D. Sharma	22
Fortification of Foods	33
Chemical Analysis of Drinking Water	42
Malnutrition	49
Some Challenges in Health Administration by Dr. K. N. Rao	57
Assessment of Nutritional Status of a Community	69
Health Team Leadership by Dr. H. S. Gandhi	73
Statistics in Health by Dr. K. K. Mathen	80
Relevant Health and Nutrition Education by J. P. Greaves and G. Donoso	97
Specific Studies : Rationale of Toxicity and Role of Occupational Health Services in Research by N. R. Ananthakrishnan, S. N. Karthikeyan and Dr. C. K. Ramchandar	108
List of Participants	117

1141

BM-200

COMMUNITY HEALTH CELL

~~1st. (First Floor) St. Marks Road,~~

Bangalore - 560 001.

PREFACE

In recognition of the need to draw plantation medical personnel closer to the changing environments of the day, a refresher course for plantation medical officers was organised by St. John's Medical College, Bangalore, through the Ross Institute Unit of Occupational Health in collaboration with UPASI. The 12 - day course (working days falling in between 25th April and 7th May 1977) consisted of a variety programme of lectures, group discussions, practicals, clinical visits and film shows. To disseminate the benefits of the course among a wide cross-section of the managerial personnel in plantations, this publication of the central theme papers of general interest is being brought out.

pss:sr

INAUGURAL ADDRESS BY Mr. K.B. SOMANA,
UPASI PRESIDENT

The pattern of organisation of health services in any country is a result of complex historical developments. It depends on the nature of common diseases, technical developments of medical science, and the social, economic and political environment. In Western countries, where scientific technology and industrialisation developed early, social organisation of medical services evolved at an early stage. I understand that even in ancient Greece, there were State physicians appointed to treat the poor who were not slaves. In ancient Rome, there were a kind of dispensaries for slaves and hospitals for military personnel. In the early Middle Ages, feudal lords took some responsibility for health services for their serfs, but the capacities of medicine were extremely limited and religious healing was more important than scientific medical treatment. In the later Middle Ages, the Christian Church organised hospitals for the sick and destitute and physicians began to set up private practices in the towns and cities.

As industry developed in the late 18th and early 19th centuries, groups of workers and artisans organised medical benefit societies for self-help in time of sickness. Hospitals came to be supported and controlled by State and local Governments. Voluntary societies were established for nursing the poor, the protection of children and combating prevalent diseases. Public health organisations were set up to prevent the spread of

.. 2

communicable diseases. Gradually, responsibility for organised health services shifted from local communities to the Government.

In India, before development of indigenous medicines, the people depended on traditional healers and a rich healing tradition had evolved. One should not underestimate the part played by faith-healers and local native doctors in helping to reduce suffering. Then came the colonial powers and they established hospitals, first for the army and the European settlers and later for the indigenous population. Eventually, Government service system was established in the colonies. Side by side, missionaries from abroad set up hospitals and dispensaries in several places. The great prevalence of infectious tropical diseases needed special campaigns against small-pox, malaria and other endemic diseases. After Independence, national systems of medical care have been organised partly on the basis of inherited ones.

Establishment of plantations in areas not reached by the Governmental agencies made it imperative for plantations to evolve its own medical service. Most of the plantation areas were originally unhealthy regions and many of them were malaria infected. Labour had to be recruited at great expense from the plains. Health of the workers was, therefore, a question of primary importance to the planter. The very existence of the Manager on the plantation depended upon his ability to retain labour. This meant not only proper labour management but also good medical care, as otherwise, the labour

shifted from one estate to another. It was, therefore, a question of enlightened self-interest on the part of the management to provide facilities on the estate. It is in this context that the Ross Institute played good part in plantations.

Plantation labour being resident on the plantation with their families, this required attention by the planter to all aspects of their welfare, living conditions, civic amenities, environmental hygiene, etc. Enormous sums of money and prodigious efforts were expended by the industry to combat malaria and it was practically banished by 1950 in the plantation areas long before the remarkable results achieved by the WHO campaign. Careful attention to hygiene and sanitary conditions, pre- and post-natal care, medical aid, maternity benefit payment, immunisation programme for children, and other measures reduced the death rate and altered the balance of survival rate.

Counselling on family planning measures and dietetic instructions to mothers have reduced the infant mortality rate. The most important cause for morbidity in an estate is hookworm infestation, with attended anaemia, and this has also been controlled to some extent, mostly due to better sanitation facilities. In fact, a comprehensive range of welfare measures had already been evolved by the employers, long before legislation was undertaken after Independence to codify them and enforce them universally under the Plantations Labour Act, 1951. This aspect was favourably commented upon by the Royal

Commission on Labour in 1933:

"If it is remembered that even in England what is generally understood as welfare work is only of very recent growth, tribute must be paid to the time and thought which have been devoted by individual Managers to the well being and comfort of their labour force."

After studying the then prevailing medical services in plantations, Major Lloyd Jones, M.D., Dy. Director-General of Health Services, Government of India, submitted his recommendations on "Standard of Medical Care for the Plantations in India" in 1947. The provisions of the Plantations Labour Act and the Rules framed thereunder in respect of medical care in plantations are based on Major Lloyd Jones' report. Many may not perhaps know that the three-tier system of dispensaries, Garden Hospitals and Group Hospitals were not innovations of Government or trade unions but they had been voluntarily established by the industry in all major tea growing districts. The Plantations Labour Act has only codified the best of the then existing facilities and tried to universalise them.

The Plantations Labour Act is the most comprehensive welfare enactment in the country, if not in the world. Apart from a complete range of medical facilities, it covers supply of drinking water, sanitation and conservancy, creche and recreational facilities, education, maternity, sickness, housing and other amenities. If properly co-ordinated, and supervised, it can result in revolutionary changes in the health, social and cultural

well-being of the workers and increase productivity. Unfortunately, though our system had evolved as health centres cum treatment centres and the medical officer and the staff concentrated not only on curative aspects but on preserving the health of the people under their charge, after the enforcement of the Plantations Labour Act, the emphasis has been shifted wholly to the curative aspect and the need to fulfil the legal requirement. Public health training has become a speciality just like any other discipline in curative medicine and, as such, there has been a tendency for separative thinking on medical care. It is in this context that I would refer to the Comprehensive Labour Welfare Scheme being implemented by UPASI on a number of Plantations. This scheme is really built around the medical infrastructure that already exists in our plantations. It attempts at planning for the total welfare of the worker and his family and I would appeal to the medical personnel to take a keener interest in this scheme.

It is heartening to see an attempt at a complete reorientation of medical services in the country, the stress being to serve the villages. The plantation industry can rightly be proud of the part it has played and continues to play in offering proper medical care in remote malnad areas.

Mainly because of our isolation, we tend to become an inward looking community unaffected by the vast changes taking place outside our immediate environment. Thus some of our systems which worked successfully in the past have

already or will in due course become outmoded. We have to keep abreast of the vast changes that are taking place, whether it is in the management world or the medical world. UPASI has been conducting a series of Management Courses to expose our managerial personnel to modern management concepts and techniques. Similarly, we thought that the time has come to expose our medical personnel also to the technical and scientific advances in the medical world. Of course, unlike most managerial personnel, you have the advantage of highly professional medical journals to keep you in touch with changes. But today medical care is a composite-discipline comprising not only diagnosis and treatment, but total health care, planning, budgeting, reviewing and resource allocation. It is in a way an integral part of management of industry. I trust that this Refresher Course would expose you to the latest developments in the management, administration and economics, apart from the medical aspects, of health care. The association of such a reputed institution like the St. John's Medical College and a highly specialised and expert team of faculty members should make this Course extremely valuable and educative. On behalf of the UPASI I would like to convey our thanks to the authorities of St. John's Medical College, its staff, and members of the faculty for readily coming forward to help us with this Course. You have an exacting Course before you and I am sure the participants will greatly benefit by it.

Ladies and Gentlemen, I have great pleasure in inaugurating this Course for Medical Officers in Plantations.

WELCOME ADDRESS

by

Major General B. Mahadevan

Dramatic changes have taken place in medical sciences in past 25 years and one may expect similar progress in future. Scientific progress leads to rapid changes of concept and approach in various fields of medicine and many diseases. It has truly been said that "Medicine is a life long Study". The continuing education of physicians implies regular study to permit them to promote the improved delivery of medical care to the population.

A medical graduate in a developed country with a sound foundation of medical education, although not ready for immediate practice, has no excessive demands placed on him, as he continues to learn and function under the immediate supervision of a more experienced practitioner. On the other hand, in a developing country like ours, the basic physician has to provide both preventive and curative care to large populations and is required to function in an independent capacity. He, therefore, at the time of graduation should have had sufficient practical experience to meet immediately the commonest health problems of his area.

The concept of Community Medicine has undergone changes. A shift is taking place in our country from a curative oriented service to a community oriented service and from hospital based medicine to a primary care system,

which includes promotive, preventive and curative services in the community. In short, Medicine has rediscovered the Community at large. It is rather amazing and ironical that a profession which began in the community should suddenly need to rediscover it.

Such changes have great relevance to the plantation industries, for questions of rural health care and primary health care are of the utmost importance in plantation settings. The plantation doctor has an important role to play in bringing about this change with the help of the employer and worker. Within limited resources of money and manpower, primary health care in remote and inaccessible areas is required to be provided by him.

A young plantation medical officer has, therefore, to be an all round physician. Plantation is an industry and the doctor is required to have in him the knowledge, attributes and attitudes of an Industrial Medical Officer. He is also a Community Physician and is required to diagnose conditions socially, environmentally and clinically and treat for both cure and prevention. He is required to apply epidemiologic techniques to analyse the effects of primary medical care on health. He has to function as the leader of a team of health workers.

The Administrative Management may lay down the "health sector objectives" in plantations but to achieve these objectives qualitatively and quantitatively, health resources should be adequate in the form of finance, manpower, facilities and supplies. I agree that there is probably scope for more efficient utilisation of existing resources and facilities.

It has been generally agreed all over the world that populations are not receiving services that correspond qualitatively and quantitatively to their needs and expectations. The cost problem may also be aggravated by the tendency for resources to be pre-empted by activities whose effect on health is small in relation to their cost. I observe from one of the papers of Dr.(Mrs.)Rahmathullah that 85% of the health budget is spent in the garden hospital which looks after only 3% of the patients. This will obviously result in a gross inadequacy of the primary health care system in plantations.

A strong competition for these limited resources continue. Unfortunately funds provided for preventive medicine produce intangible and often invisible benefits over a long period of time like decreased infant mortality, reduced mortality and increased life expectancy, compared to the immediate and dramatic results achieved in the curative field. Everybody agrees that the former investment is more beneficial to the nation, both from the macro and micro aspects of Health Economics, but unfortunately just the contrary is done.

The recent report of the Group on Medical Education and Support Manpower has enjoined that during the last 30 years sustained efforts have been made to implement the "health sector objectives" laid down by important Committees like Bhore Committee, Mudaliar Committee and so on. In spite of substantial investments made and impressive results obtained, particularly in production of medical manpower, the health status of our people, be it in rural

areas or plantations, is far from satisfactory. The sheer magnitude of the tasks that still remain is so great and the resources available for the purpose so limited, that one almost despairs of meeting our health needs or realising our aspirations on the basis of the broad models we seem to have accepted.

The medical profession itself, which is noted more for its conservatism and individualism than flexibility, has to accept its share of the blame. Many changes are required. One undoubted need is for a change in the attitude of health personnel, who with the present patterns of medical education are being supplied with skills but not motivation for the type of work demanded of them. They obstinately cling to Western models of easy medical practice. Curricular changes are inescapable. Medical Colleges have been challenged to restructure their position in the community. They have now been asked to accept a major service responsibility for a segment of the adjacent community.

Both consumers and providers of health care services are deeply concerned about the mounting costs of health and medical care. As a result, increasing attention is focussed on the development of more effective and efficient ways of utilising scarce and costly healthy manpower resources.

This leads me on to the subject of the managerial role of a doctor. A Community Physician in particular has to be a good "Managerial Physician". With the increasing quantitative and qualitative demands on health services,

with the continuously rising cost of providing health services and various other problems I have already referred to, managing with the limited health resources becomes more complicated and the use of efficient and effective management techniques are indispensable to enable medical personnel working at all levels of the health system, to take correct or better decisions than at present.

There are two contrasting approaches to administrative management - one relying heavily on symptomatic diagnosis followed by symptomatic intervention and the other depending more on causal diagnosis followed by causal intervention, whether preventive, curative or rehabilitative. The first is the "traditional" or capital intensive approach and the second the "modern" and more acceptable labour intensive one. If a change has to be made to the latter approach, it is very essential to have a healthy dialogue between administrative managers and health personnel for a meaningful and purposeful utilisation of resources and I am sure such opportunities will be opened up in future. I hope the President of UPASI is in agreement with this proposal.

I think it is desirable that I leave the subject at this stage, for in trying to project the required management profile of a doctor, I may try to use more of the customary management parlance and in so doing, will run into troubled waters and bungle. There is a ray of hope for future basic doctors, for I understand that our Dean proposes to introduce these subjects in the curriculum of Undergraduates both at the pre-clinical

and internship stage levels. Such doctors I am sure, will be better equipped in every way to function as efficient "Managerial Physicians" of the future.

Our two weeks training programme for the Plantation Medical Officers has tried to embrace recent advances in internal and community medicine, including dealing with medical emergencies of various types. The training programme has placed emphasis on discussions, so that there is a free exchange of views and interaction between faculty staff and students. Most important of all, we have with the ready cooperation of the Indian Institute of Management, Bangalore, introduced a whole morning session for discussions on "Health Management" - basic concepts and Health Economics". A workshop study by Syndicates on various organisational and operational aspects of Plantation Medicine, including the skilled and economic use of pharmaceuticals, has been planned by the Medical Adviser of UPASI. I wish to express our sincere thanks to the Director and Faculty staff of the Indian Institute of Management, for arranging these collaborative sessions.

I do sincerely hope that the Plantation Medical Officers will benefit from this course. They have been doing a fine job of work so far, considering the limited resources, difficult terrain and communications, they are functioning in. I am sorry this intensive course with so many post supper sessions, does not give you much time for social exercises and activities in Bangalore. But I am glad that such courses, besides being an academic

-: 13 :-

exercise, do help to boost your morale by taking you away, at least for short periods, from the "dreariness of labour and loneliness of thought" that you experience in your workplace in Plantations.

I welcome you all again to this inaugural function.

HISTORICAL DEVELOPMENT OF MEDICAL SERVICES IN PLANTATIONS

Legend says that coffee was introduced into Chikmagalur in Karnataka state in 1600. The earliest reference to planting of an estate is given as 15th September 1805. In 1824, Government was very keen on encouraging the enterprise of coffee growing and passed a resolution to this effect. Tea was introduced first in Nilgiris in 1834 from Kew gardens unaware that the plant was growing indigenously in Assam. However, tea planting on a commercial scale started in 1853. The first company to be formed was the Assam Company in 1839 but it was not until 1852 that it was proved, that tea from India could compete in the London Market with that produced in China. Expansion of tea gardens started after 1893. Anamallais was the last planting district to be opened at the turn of this country.

Development of Medical Services:

As the plantations opened up, one of the major problems the planters faced was getting labour into those remote isolated malaria infested jungles. This led to a system of contract for labour known as the "Kangani System". However, retaining the labour was an effort and this necessitated the development of rudimentary housing, medical services and employment.

In order to understand the development of health services in plantations, one needs to review the development of health programmes in the private sector elsewhere in the world, at the turn of the century. The first effort

to develop public health services in a backward agrarian region were those initiated by Rockefeller Sanitary Commission in Southern States of USA. With the end of Civil War in 1860-1865, the Northern business men wanted to develop the south fast. This concern to develop the south arose from the populist revolt in 1898 against their systematic exploitation by the Northern and Eastern business men. The revolt collapsed, however, the business community recognised the cause of the revolt and decided to undertake a planned development of the Southern agriculture, restructure the education and thus form the government. In this, public health played a great part and subsequently formed the basis for the American strategy in aid for the 3rd world after World war 2. There were few reasons for this massive effort in Public health measures. Worktime lost due to illness was a major factor limiting the productivity of the work force. Hookworm was rampant leading to anaemia.

The greatest single campaign was anti-hookworm campaign and was linked to the education campaign. This represented the determination of the priority and also socialisation of the private cost of production. This was necessary to break down the antipathy of the labour and small farmer towards big capital which was the cause for the revolt.

The hookworm campaign was followed by anti Malaria campaign. This is the first example we see where the larger socio-political factors and the conflicting interaction between the labour and the business community was

dealt with benefit to both. In the third world, the same desire of the business community gained trust and goodwill of the local population led to development of modern public health measure. In India, one of the major campaigns against disease was Malaria control in the plantations. Dr. Lloyd Jones said in his 'Standards of Medical Care for Tea Plantations in India, 1947', "It would probably be true that the anti Malarial campaign in the tea industry in India has been the highest single campaign against disease anywhere in the world".

In the Central American Banana Plantation, hospitals were provided as early as 1899 for one reason only i.e. of self interest "Sick people cannot work". This was true in the plantations in India also. Houses were provided to retain the labour. Husband and wife were given jobs and medical centres developed as an economic necessity. The Malaria campaign was an economic necessity. Soon these rudimentary medical services had to expand and it was realised that no single estate could provide satisfactory medical services in isolation. This led to the early movement of "Group Practices". A number of estates in a region (British owned) contributed the finance for a referral institution with Chief Medical Officer as the medical adviser. The Chief Medical Officer was recruited mainly for his skill as a surgeon.

In 1898, the Wynaad Medical Association was established which later became the Wynaad Medical Fund. In 1919, the Central Travancore Medical Fund was founded and in 1918, the Anamallais Medical Fund. The growth

and the systematic coverage of large groups of workers in Medical needs coincided with the development of large company managed properties. The limitation of the group practice depended on the degree of cooperation and standard of service. The single greatest service the group practice achieved was the control of Malaria. It was taken up on the advice of the Ross Institute which set up a local research centre at Meppadi in 1925.

In 1943, the Government of India appointed a Health survey and development committee to make a survey of the prevailing position in regard to health and make recommendation for the future. This came to be known as the Bhore Committee, and the recommendations have influenced the development of medical services in India.

Mr. R.G. Rege as a member of the Labour Investigative Committee reviewed the conditions of labour. In 1947, his observations were made:

" The health and physique of plantation workers were not too good though it was better than that prevalent in the villages... Ante-natal and post-natal clinics were conducted in an organised manner and this contributed towards the low maternal mortality and infant mortality rates... Deliveries were taking place in hospitals though women were reluctant to come to hospitals due to lack of lady doctors and midwives... Common complaints were bowel complaints, worm infestation, respiratory disease and malaria... bore or trench latrines are provided for a block of 5 or 6 houses. Water was provided through pipes but not protected."

In 1947 Dr. Lloyd Jones made a technical survey of plantations:

" Vast bulk of morbidity and mortality was due to conditions arising from poor diet, poor sanitation, untreated or inadequately treated water supply and ignorance of workers... Tea garden practice in essence is a type of rural practice and must be regarded as such in evolving a planned scheme of medical care... There is a general tendency to regard medical care as a matter of providing fully equipped and specialist staffed hospitals. The value of a good hospital is not underrated but from the economic and humanitarian point of view, more deaths and morbidity take place due to lack of simple facilities of medical care than due to lack of sophisticated facilities".

In 1947, the initial step towards introduction of the Plantation Labour Act of 1951 was set up by the labour conference held in Delhi on 8th and 9th of January 1947. The precise resolutions on the subject were:

" The general view was that the Government should prescribe the standards and enforce them, the actual provision of medical services being left to the employers. Large gardens would run their own services while small gardens would combine and share the expenses".

" It was agreed that the employers should submit their proposals to the Government through the Provincial Governments and that the matter should be discussed again at the next conference".

In 1951, the Plantation Labour Act was passed whereby, the provision of health services became the

responsibility of the individual gardens, while the Government would prescribe the standards and enforce them. The PLA of 1951 ensured distribution of health services and hoped the services would **grow**, depending on the felt needs of the community, with a central referral institution, central laboratory services, consultancy service and central medical store. The process was carried out on the large corporate sector while the smaller estates relied on providing the minimal service required by law. The defect in the PLA of 1951 was, in not making the development of health services mandatory by law.

In 1951, after the enactment of the Plantations Labour Act there was very little scope for innovation or change. Secondly, with labour being available constantly on the garden, the need to develop programmes to retain labour became redundant. The socio-political thinking in the country did not identify health and welfare as a priority. In this environment to associate health and welfare as an economic necessity became irrelevant to the managers.

Relationship between Medical Officer and Manager:

In the corporate sector, the Chief Medical Officer was given the status of an executive before independence. He was an English doctor whose sole aim was to look after the European community. However, there were **eminent** doctors like Dr. Ronald Ross and others who looked into epidemiology of disease and took active part in combating illness. They developed a system of service that was meaningful to the industry, which later got incorporated into the

Plantations Labour Act. However, this left a mark on the attitude of the managers to the Medical Officer. The estates had a British Chief Medical Officer but the other medical officers were local apothecaries and hence given a non executive cadre. With replacement of the apothecaries with medical graduates the status did not change. On some estates, they have upgraded the post of the Medical Officer to that of an executive. However, this has not brought about changes in attitude of the management. The Chief Medical Officer developed the services depending on his speciality and on his perception of felt needs. The education that the Medical Officer had and still has is Western orientated which places the responsibility of seeking aid for health on the patient and not on the doctor to identify the health needs of the community. As such, the Medical Officers started working under stress and strain as the attitude of the management was to keep medical expenses to the minimum and just fulfil the Plantations Labour Act and the doctors with their background wanted to develop small country hospitals. This led to frustration.

The manager looks upon health services as an expense governed by the Plantations Labour Act with no quantifiable returns and thus health care got isolated from the general development of the property. The Medical Officer equated health with curative services and hospital expansion. By virtue of his position, attitude and function, he started operating in isolation without being involved in or integrating himself into the industry.

The para-medical staff controlled by the Estate Staff Union equated their function through hospital orientated views by negotiating for their rights while accepting some functions which were historically evolved.

The Government enacted laws to enforce proper distribution and prevent exploitation of the employees. They also progressively enacted laws based on the recommendations of the Bhore Committee with regard to the personnel required for health services. Labour Officers, appointed to inspect the plantations, had no medical background and recognised health care as being well stocked, well equipped hospitals. The District Medical Officers who were required to visit the estates' medical services found little time to do so and generally held the same attitude towards health care as that of the labour officer or health inspectors.

Today, there is a realisation that health and welfare are an integral part of development and health is an economic necessity. However, trying to break away from the historical evolution is becoming a challenge and it is to see how these challenges can be faced that we are here. It needs everyone's effort, everyone's ideas and a combined multi-disciplinary approach.

EVALUATION OF HEALTH PROGRAMMES

by

Dr. M.I.D. Sharma

Evaluation has been defined as the "process of determining the value or amount of success in achieving a predetermined objective" (James, 1962). Evaluation of any health programme, therefore, means the assessment of the degree of success which has been achieved at a particular point of time in relation to the long term objective set for the programme. It is just like physician continuously evaluating the progress of a patient under his care which enables him to make changes in the treatment when considered necessary.

There is a tendency to have complete faith in the organisational and operational aspects of a programme and entertain hope that the set objective would be achieved during the period stipulated. Such an attitude is not scientific because proper assessment of the success achieved is essential to discover the weaknesses of the organisation and shortcomings of the operational aspects of the programme to enable the execution agency to incorporate remedial measures in time. Recently in India, setbacks encountered in some of the well conceived programmes like the National Malaria and Smallpox Eradication programmes have shaken the faith of the health workers in the administrative and operational aspects of the programmes and have made them realise the urgent need of evaluation.

To get the full support of the governmental agency concerned for any health programme and to win the public opinion whose participation in programme activities is essential,

the **achievements** have to be determined, highlighted and made known to them. This can **only** be done through proper evaluation.

The evaluation process is in the form of an ascending spiral beginning with evaluation at each stage. Initially base line information on the proposed programme is obtained, then the goal of the programme is set, yardsticks for measuring the goal are determined, the goal attaining activities are identified and put into operation and the effect of the goal on the total problem is appraised. The process is repeated in an ascending order till finally the ultimate objective is achieved. The procedure is similar to the one followed by the physician who diagnoses the disease of his patient, determines if the disease can be cured or only symptoms are to be relieved, finds out the manner by which the progress of the case is to be assessed, measures his progress, identifies the particular treatment which suits the patient, put him under this treatment and notes the effect till finally the patient no longer requires attention from him.

It is clear that if the programme is progressing successfully, the spiral would be ascending, if it is standstill and does not get off the ground it would move in a circle indicating failure. Before considering the programme evaluation itself, it would be useful to discuss briefly the manner in which the goals of health programmes are set up.

SETTING UP OF GOALS OR OBJECTIVES OF HEALTH PROGRAMMES:

The two most important factors which lead the authorities to set up goals for health programmes are

the community health needs and the availability of technological skills (Vickers, 1958). A health need is the lack of a service or programme required to protect and maintain the health of a community. For example, in a cholera endemic area, the prime public health need is safe water supply and therefore, the provision of protected water supply becomes the goal for that community. In an area, if smallpox is a serious problem and with examples of a number of countries having eradicated it through vaccination, the technological skill being available and the feasibility of its succeeding in clearing the area of the disease being there may determine this as the particular public health goal. In both the cases, the setting up of the final objectives is also dependent on the resources in men, money and material which can be mobilised by the agency responsible for that community. If the resources are limited, the goal may have to be scaled down or the period for achieving it may have to be adjusted accordingly. Though in one case the ultimate objectives is the control of cholera and in the other, eradication of smallpox, for the execution of each programme, initial and intermediate objectives are also chalked out. In the former case, the initial objective may be the selection of source of water, its disinfection and its supply through pipes and the intermediate objectives is the detection, isolation and treatment of cholera cases and inoculation of the vulnerable groups of population. In the latter case, the immediate objective is the interruption of transmission of smallpox by vaccination of the population and for the intermediate

objective, vigilance on the moving groups of population who are vaccinated is exercised.

The evaluation of any health programme is done with certain objectives in view. For planning for future, it is necessary to obtain base line information through evaluation on the achievements of the programme so that the future course of action is planned on a known base line.

The other purpose of carrying out evaluation is regulatory in nature, ensuring the full and effective utilisation of the staff and facilities of the programme. If those charged with the execution of the programme know that concurrent, as well as, periodical evaluations are being carried out, they would continue giving their best. Similarly by identifying the weaknesses and the strong points in the technical, administrative, logistic and fiscal aspects of programme, it would be possible for the evaluating agency to make such recommendations that the best use of the strong points is made and then formulate and suggest corrective measures for the weak points so that the programme is run on sound basis keeping the practical considerations in view.

ORGANISATIONS FOR EVALUATION:

Internal evaluation by the executing agency:

A properly run programme has some sort of machinery for its continuous evaluation so that the short-comings are detected immediately on their occurrence and corrective measures to rectify the same are introduced as early as possible.

External or independent evaluation by outside agencies:

In addition to the programme organisation itself, the activities may be evaluated with advantage by an outside agency which can have an objective view of the whole thing. Such outside evaluation has been resorted to by the National Malaria Eradication Programme through the independent appraisal teams comprising of national and international experts. Similarly, the National Smallpox Eradication programme was evaluated by a W.H.O. team in 1967. There is also a view that the evaluating agency be independent of the programme executing agency so that the evaluation is realistic, unbiased and objective.

Assessment of the achievements of the programme by the executing agency has been termed as "progress reporting" and that by an independent agency as "evaluation" by the Administrative Reforms Commission (ARC, 1968). Evaluation, according to the ARC, must be carried out by an agency which is not responsible for the execution of the programme concerned^{if}/it has to be meaningful and independent. This evaluation is not restricted to the programmatic side of the plans only; the policies underlying them also come in for appraisal. The Programme Evaluation Organisation (PEO) is such an agency created in 1952 at the Planning Programme in 1963-64 and is engaged in a similar endeavour during the current year. Another body, the Committee on Plan Projects was constituted by the National Development Council in 1956 to organise investigations into the working of important plan projects

through study teams. Though the studies conducted by the PEO and COPP have been useful, there are many important programmes which have not yet been touched by either of them.

The ARC also stated that there has been a tendency to assess the performance of a project more in terms of progress of expenditure rather than in terms of physical achievements and which according to them was bound to give a misleading picture. They, therefore, recommended that the existing evaluation machinery may be strengthened and in this connection at the Planning Commission, they desired the merger of PEO and COPP by creating the Evaluation Wing placed directly under the charge of the Deputy Chairman of the Commission. The functions of the Evaluation Wing should be to study continuously the more important plan programmes and schemes in the central sector, undertake sample studies of programmes in the State sector and guide evaluation work in the States. According to them, the evaluation reports prepared by the Planning Commission should be placed before the Parliament. They also recommended that planning cells in the ministries should in addition to their duties be responsible for carrying out evaluation studies in areas not covered by the Planning Commission. In regard to State programmes, the evaluation should be entrusted to State Planning Boards and an Evaluation Unit should be set up in each State Planning Board as its integral part to meet the need for independent evaluation of the programmes of the State

and their evaluation reports should be placed before the State legislature. It is understood that an Evaluation Union has been established in each State.

For a programme to succeed, it is essential that the agency responsible for its execution is able to identify and understand the problem areas in it which are complex in nature. To facilitate the recognition of such trouble spots early, it is necessary to have a multi-disciplinary team consisting of a public health administrator, a social scientist and a statistician for evaluation.

PERIODICITY OF EVALUATION:

Concurrent evaluation: In any health programme, internal evaluation or progress reporting should be built in so that evaluation of the programme is carried out simultaneously as the programme progresses. This is important because then the important events are detected at the time of their occurrence instead of their being studied in retrospect. Concurrent evaluation provides information about the weaknesses of the programme which can be rectified immediately. It also discovers the strong points of the programme which may further be exploited to the fullest extent in the interest of the success of the programme. This is a useful continuous feedback on the programme.

Periodical Evaluation: Periodical evaluation may be carried out by agencies not directly connected with the execution of the programme who may view the performance in an objective manner and may formulate suitable recommendations to improve the same. This has been with advantage in

the case of the National Malaria and Smallpox Eradication programmes and the Family Planning Programme.

Terminal Evaluation: Evaluation is also to be carried out as a terminal activity when the prescribed ultimate objective is stated to have been achieved, say the eradication of malaria or smallpox from a country or a State. This too should be carried out by an outside agency.

In any health programme, the ultimate objective has to be precisely defined. For example, in the Smallpox Eradication Programme, the ultimate objective is the complete elimination of morbidity and mortality due to this disease. The initial or starting objective should be the coverage of the population with vaccination, which is the attack phase. As an intermediate objective, during the consolidation phase, watch is kept on moving groups of population who are vaccinated and mopping up operations are carried out in areas which may have been initially missed. When the ultimate objective is reached, in the maintenance phase, vigilance machinery ensures detection of any imported case or secondary introduced cases arising thereof.

The initial, intermediate and ultimate objectives are both performance and impact objectives at each level. For example, in the Smallpox Eradication Programme, the initial performance objective is 100 per cent coverage of individuals, requiring primary vaccination and more than 80 per cent coverage of persons requiring re-vaccination and the impact due to these would be

appreciable reduction in the morbidity and mortality due to smallpox. During the consolidation phase, intermediate performance objective is coverage with vaccination of left overs and immigrants and the impact objective would be the absence of morbidity and mortality in such vaccinated groups. When the ultimate objective is attained, that is during the maintenance phase, the indigenous population would be free from smallpox and this freedom from the disease would be kept up through strict vigilance on the immigrants, isolating any case found in them or the introduced cases and effectively vaccinating such vulnerable groups.

OBJECTIVES IN THE SMALLPOX ERADICATION PROGRAMME:

Attack Phase:	Initial objective - Performance, 100% primary vaccinations and 80% re-vaccinations. Impact - Reduction in morbidity and mortality
Consolidation Phase:	Intermediate Objective - Performance, coverage of left overs and immigrants.
Maintenance Phase:	Ultimate objective - Performance, vigilance on immigrants Impact - Disease-free status of the commu- nity assured.

It is also seen that these objectives are based on certain valid assumptions and operations based on these assumptions result in the progress from a lower objective to the next higher one. For the initial objective of the Smallpox Eradication Programme, the relevant assumptions are that with 100 per cent primary vaccinations when by least, 95 per cent of them are successful and with more

than 80 per cent of every sector of the population having been re-vaccinated and at least 30 per cent of the re-vaccinations being successful the immunity status of the community is such that there is no transmission of the disease in them and the intermediate objective or consolidation phase is reached (Ramakrishnan and Celfand, 1964). During this period, the disease may be found in missed population and moving groups of people only. Such persons are dealt with accordingly and the ultimate or the maintenance phase, is reached. During the maintenance phase by keeping strict watch on imported cases, isolating and taking remedial action for the contacts, disease free status of the community is assured.

Evaluation of any health programme may be carried out to assess the efforts put in, the performance as a result of them and to estimate the adequacy of performance and efficiency. The efforts put in would depend on the adequacy or otherwise of specific kinds of qualified health personnel and the assessment of performance would indicate if their output **has** been as planned, required and anticipated. Estimating the adequacy of performance would give some measure of the extent of the total problem solved. Such an evaluation indicates as to how adequate the performance has been in terms of the ultimate objective. Estimation of the adequacy of performance may indicate that the progress has been as planned but the efficiency of the organisation has also to be assessed to be seen that there is no wastage of human resources. Similarly it has to be seen that there is no wastage of money or

materials. No programme can be justified at all cost and a measure of efficiency is dependent on the performance of the workers in the hierarchy of the organisation from the lowest to the highest levels. Therefore, such a scrutiny would be necessary to ascertain if the same end result could be achieved at a lower cost say by the substitution of less skilled personnel for some specialists. Similarly in terms of the material, less costly materials could have been with equal effectiveness.

Every evaluation should also analyse the processes and policies involved in the programme and identify the factors which may have contributed to the success or failure of the programme. Such an analysis would help in future planning wherein the weaknesses contribute to the fullest extent for the success of the programme. It may also be seen if the operations can be improved by making some changes in the techniques and methods.

It would be useful to find out as to which programme benefitted the most and which most used and how the lessons so learnt may be utilised to streamline the operations. Some unforeseen problems may also be brought out which may need urgent research studies for their education. In conclusion it may be stated that the evaluation of a programme provides base line information at a particular point of time when it was carried out, it gives information on the post activities and indicates the course of action which may be followed in future with advantage.

FORTIFICATION OF FOODS

In India, there is still a basic shortage of food among several population groups which live merely on subsistence rations. As a result, even the energy needs of such population groups are not met with, let alone the requirements of other nutrients like proteins, vitamins and minerals. A tremendous effort has to be made to meet the quantitative and qualitative requirements of food.

On the agricultural front, the development of the high yielding varieties of cereal crops have justifiably raised our hopes. Along with this "agricultural revolution," efforts have to be made to make the best possible use of available food resources. Concurrently, efforts must be also made to augment the supplies of protective foods such as milk, eggs, pulses, vegetables and fruits. These efforts will no doubt take time. However, the qualitative deficit in an average Indian diet needs to be rectified as quickly as possible. It is here that 'fortification' offers an approach worth the trial.

Cereals, which form the staple food in India and constitute nearly 80-90% of the diet are deficient in several nutrients and can be improved in nutritional quality by fortification. Other foods like hydrogenated oils, infant foods, canned fruits and vegetables, supplementary protein concentrates made from oilseeds meals have to undergo commercial processing before reaching the consumer. Nutrients which are present in unprocessed foods might get destroyed during processing. Therefore,

these nutrients have to be added back to the foods in a synthetic form. Thus 'fortification' and 'enrichment' of foods can be an effective approach for providing a more wholesome and balanced diet.

'FORTIFICATION AND ENRICHMENT' OF FOODS

The food fortification committee of the Indian Council of Medical Research has given the following definition of 'fortification' and 'enrichment':

" Fortification of a foodstuff denotes the addition to a food of one or more dietary essentials in amounts which make the total content greater than that found in that particular food in its natural state. By fortification also meant the addition of one or more dietary essential to a food which the latter does not contain in its natural state".

On the other hand, the term 'enrichment' is used to signify the addition of dietary essentials to a food to restore the total content of the former to the levels obtaining in the food in its natural (unprocessed) State'.

FORTIFICATION OF FOODS IN PRACTICE

Rice: When raw rice is milled to get polished white rice, most of the nutrients present in the germ and the outer layer of the grain, especially the B-Vitamin, Thiamine, are removed along with the husk. A process was developed in the United States whereby rice grains were enriched by soaking them in a solution rich in tiamine coat. The letter prevents loss of vitamins during the subsequent

washing of rice. This enriched rice 'premix' was mixed with ordinary polished rice so that the vitamins were present in the final mixture in amounts equal to what was present in the original unpolished rice. This 'enriched' rice was used in the phillippines in 1947-50, and the incidence of beri-beri, a disease caused by the deficiency of thiamine was reported to have decreased significantly as a result.

The introduction of 'premix' in our country, however, involves several problems. The mixing of 'premix' with unfortified rice would have to be done at certain centralized places from where distribution of the enriched rice will have to be carried out. Most farmers produce the crop and consume it right off the fields. Thus, enrichment of rice involves many logistic problems and operational difficulties and, therefore, may not be feasible at present in our country.

On the other hand, parboiling of rice is a traditional practice in India. The paddy is steeped in water, steamed, dried and then dehusked. The nutrients which are present mainly in the rice germ and the outer layer of the grain get diffused inside the grain during parboiling. In this parboiled rice, even if milled later, loss of nutrients is prevented to a considerable extent. However, parboiling as is done by the trade may often impart an unpleasant odour, flavour and appearance to the rice due to fermentation occurring during parboiling. Therefore, the raw polished rice, which is aesthetically superior though nutritionally inferior to the parboiled rice,

is often preferred. Attempts have, however, been made by the Central Food Technological Research Institute in Mysore and Jadvapur University, Calcutta, to develop an improved method of parboiling of rice. This improved method appears to be coming increasingly popular with many mill owners. Thus the prospects of providing parboiled rice with consumer acceptability are quite good. The Government of India have placed restrictions on the extent of polishing and to a certain extent this prevents the complete removal of nutrients from the rice. For the present, parboiling seems to be a more practicable solution than production of an enriched premix in India, at least with regard to rice.

Wheat (Atta) Maida (refined flour) and Bread: During the Second World War, the United Kingdom undertook to fortify and enrich several foodstuffs. All flour was milled to 85 per cent extraction only, which left enough thiamine (vitamin B₁) in the flour and the addition of synthetic thiamine was unnecessary. Since wheat flour is deficient in calcium, calcium carbonate (Chalk) was added at the rate of 392 g. of calcium carbonate to 280 lbs. of wheat flour. The practice of enriching wheat flour with vitamins and minerals has continued in the post war years also.

The United States have strict legislation on fortification and enrichment of foods. Rigorous standards have been laid down for the levels of nutrients to be added to various foodstuffs. Almost all refined flour in America is fortified with thiamine, riboflavin, niacin, iron and sometimes with calcium also.

In India, wheat is consumed mainly as whole wheat flour (almost 100% extraction) which has adequate amounts of the B-vitamins. However, it is lacking in calcium and, therefore, the sub-committee on Food Fortification of the Indian Council of Medical Research recommended in 1953 that wheat flour can be enriched with calcium carbonate.

There is an increasing trend towards consumption of bread in urban communities in India today. Bread is made from maida or refined flour which is poor in the B.Vitamins compared to the wheat flour. Thus, there is necessity for a judicious enrichment of the flour used in the bread industry. The establishment of several modern bakeries is a first step towards improving the nutritional quality of bread. These bakeries have been set up at Bombay, Calcutta, Delhi, Hyderabad, Madras, Ahmedabad and Cochin with the help of many friendly foreign governments. The bread prepared in these bakeries is fortified with vitamin A, B-complex, iron and the amino acid lysine, nutrients in which refined wheat flour is usually poor.

In February 1970, the Government of India launched a programme in Bombay for fortification of atta with vitamins and minerals and for increasing the protein content by admixtured with edible groundnut flour. A concentrated vitamin-mineral mixture containing vitamin A, Riboflavin, niacin, thiamine, calcium and iron salts is prepared in a pharmaceutical factory and mixed in a selected flour mill with edible groundnut flour containing 45-50% protein. This "master premix" is distributed to

other flour mills in the city for blending with atta at a level of 5 per cent. This programme is planned to be extended to the metropolitan areas of Delhi and Calcutta at a later date.

Hydrogenated Fats and Oils: Fortification of margarine with Vitamins A and D is compulsory in several countries (the U.S. and Europe) Consumption of "Vanaspati" (hydrogenated fat) is becoming popular in India and vanaspati is replacing ghee (clarified butter) and vegetable oils in many preparations. Fortification of vanaspati with Vitamin A has been made compulsory (700 International Units of Vitamin A per ounce of vanaspati) by the government and many manufacturers add Vitamin D in addition.

Milk: Several countries in the west are enriching milk with Vitamin D. This is essential because of paucity of sunlight in those countries during the long winter month. In India, a substantial amount of vitamin D is synthesized in our skin when sunlight - direct or reflected - falls on it. Therefore, milk does not appear to require to be fortified with Vitamin D in our country.

Skimmed milk powder is used in the feeding of children and pregnant and nursing women in many countries. Since skimmed milk powder is poor in Vitamin A which is badly needed by these segments of the population many manufacturers fortify skimmed milk powder with synthetic Vitamin A.

Several proprietary infant foods based on milk are fortified with Vitamin A, D, B6, C and iron and some with vitamin B12 even. Spray dried milk powders are deficient

in vitamin B₆ (pyridoxine) which is lost during the processing, and addition of pyridoxine to spray dried milk powders is carried out as a routine procedure.

Common Salt: In the Sub-himalayan regions of India, goitre, a disorder caused by insufficient intake of iodine, is very widespread. The incidence of goitre has been reduced to a great extent in the United States and Latin American countries by the distribution of iodized salt to the populations in the goitre regions. In India, a pilot project for distribution of iodized salt has been undertaken in the endemic areas. The salt consumed in India is usually not the free flowing table salt but the crystalline, impure variety. Potassium iodate has been found to be more stable than potassium iodide and is added to the salt supplied in these areas. Carefully controlled studies carried out so far have shown that the consumption of iodized salt in these goitrous areas has brought down the incidence of goitre.

PROBLEMS ENCOUNTERED IN FOOD FORTIFICATION

For any food fortification programme launched on a nation-wide scale, or even at a regional level, to be successful several factors need to be considered.

*There has to be a centralized agency which takes care of the technology involved in the fortification.

*The vehicle or the food item which is fortified must be such that it reaches the maximum number of consumers. Salt, tea and bread are instances in point.

*The nutrient added must be in stable form to withstand subsequent loss due to storage under varying conditions of humidity and temperature.

*The fortified food must not be radically different in appearance shape, colour and taste to the food people are used to. This is very important from the view point of gaining popular response from the average consumer.

*Last but not least, the cost of the fortified article of food should not be any different from the unfortified food.

Judged by all these criteria, fortification of salt and bread appears to have caught up. Recently, the National Institute of Nutrition has carried out extensive researches on the possibility of fortifying common salt with calcium and iron. The results have been encouraging and based on these investigations, fortification of salt with calcium and iron will be taken up on a national scale in the near future.

In accepting fortification as a national policy certain other considerations should not be lost sight of undeveloping countries with expanding populations, the reliance has perforce to be placed mainly on an adequate supply, especially of protective foods, to meet the nutritional needs of the population. Also in considering the quantities and kinds of nutrients to be used in fortifying different foodstuffs, it is useful to take into account the nutritional deficiencies of the total diet of the population rather than of any single foodstuff

alone. Fortification should not also be indiscriminate, as use of nutrients in quantities more than what is needed will only be a waste and may add to the cost of the final product which a population subsisting on marginal income can ill afford to bear. |

.. 42

CHEMICAL ANALYSIS OF DRINKING WATER

The medical man should have a clear conception of the information that can be obtained from a chemical analysis of water, the inference he may derive from each item individually and from the items collectively. An examination is made for the presence or absence of a particular constituent, its exact amount determined (if necessary) and an opinion is formed whether this particular matter is objectionable or not. The mere presence of the constituent (like lead or nitrites) may render the water undesirable; on the other hand, the objection may be on account of the large amount of the constituents (like sodium, chloride earthy salts or suspended matter).

Colour: Water should be clear and practically colourless. Colour is due to colloidal vegetable matter dissolved in the water. It is the commonest in upland surface waters and in flood waters after droughts. It is often removable by filtration.

Odours and Taste: If bad due to vegetable decomposition, as a rule Algae are the common cause. They decompose and liberate oils having unpleasant tastes and odours. Anaerobic decomposition in deep wells may also cause unpleasant odours and tastes. **Such** odours and tastes must be removed before delivery for consumption.

Total Solids: Drinking water should be free from suspended solids. The determination of the amount of suspended solids gives useful information as to the working

and efficiency of filters and settlement tanks. Slow sand filters generally cannot work efficiently when the suspended matter is from 40 to 100 parts pm. Suspended matter is more in waters that are moving rapidly and the particles, therefore, do not settle, like in river waters and in some upland surface waters immediately after a heavy rainfall. The amount of dissolved matter is proportional to the length of the journey the water has performed and to the opportunity of contact with soluble minerals. River waters and deep well waters belong to the group which contain the higher amounts of dissolved matter. People in certain areas in India are habituated to drinking waters containing up to 1000 ppm or more. In U.K., the limits are placed between 300 and 400 ppm. In U.S.A. it is 500 ppm.

Salinity: Sodium chloride gives a brackish taste to the water. Generally speaking, 500 ppm should not be exceeded, while 1000 ppm would be considered the upper limit. These remarks apply to chlorides from natural sources and not from sewage. Urine contains 1% NaCl. A small amount of chlorides from this source, therefore, may indicate a large degree of sewage pollution. The limit from this source may be placed from 10 to 30 ppm. The normal chloride content of ground water varies in different places (inversely with its distance from the sea) and places having the same content are joined by lines known as 'isochlors'. Increases from the normal on these lines would lead to suspicion of sewage contamination.

Hardness: The total hardness of a potable water should not exceed 300 ppm. A fairly soft water would

have 50 to 100 ppm hardness while a fairly hard water would have 250 to 350 ppm. Carbonate hardness may be removed by the addition of lime (Clarke's process) while non-carbonate hardness may be reduced by the use of soda ash (Na_2CO_3) or permutit.

Ammoniacal Nitrogen: The origin of this constituent may be (i) the atmosphere over cities (ii) sewage and vegetable matter (iii) reduction of nitrates in soils containing iron salts (iv) industrial wastes. Sewage is more putrescible than vegetable matter and, therefore, contains more of ammoniacal nitrogen. In the tropics, putrefaction goes on more slowly in surface waters than in temperate climates, due probably to the effect of strong sunlight on the nitrifying organisms. The limit of 0.02 ppm should be looked on with suspicion of organic pollution.

Albuminoid Nitrogen: This originates only from organic matter. Vegetable matter deteriorates more slowly than animal (sewage) matter, as the latter is partially predigested in the intestines. A large amount of albuminoid ammonia as compared with the ammoniacal ammonia is therefore indicative of vegetable (peaty) contamination. A limit of 0.05 ppm may be placed for this item.

Oxygen Absorbed: From permanganate solution, organic matter which is not decomposed or is partially broken down only will take up oxygen. Therefore, vegetable matter absorbs much more of oxygen than sewage. The limit for this constituent may be placed at 1 ppm.

Nitrites: The presence of even a trace of this item suggests recent organic pollution. It is an unstable

product and does not remain so for long. It is soon oxidised to its final stable product of nitrates.

Nitrates: This is the end product of all organic protein matter, which is now converted to the inorganic state and stabilised. It is present in most waters and by itself is not a dangerous constituent.

A high figure for ammoniacal ammonia, some albuminoid ammonia, comparatively low oxygen absorbed and the presence of chlorides indicates sewage pollution. If nitrites are present also, such pollution is of recent origin.

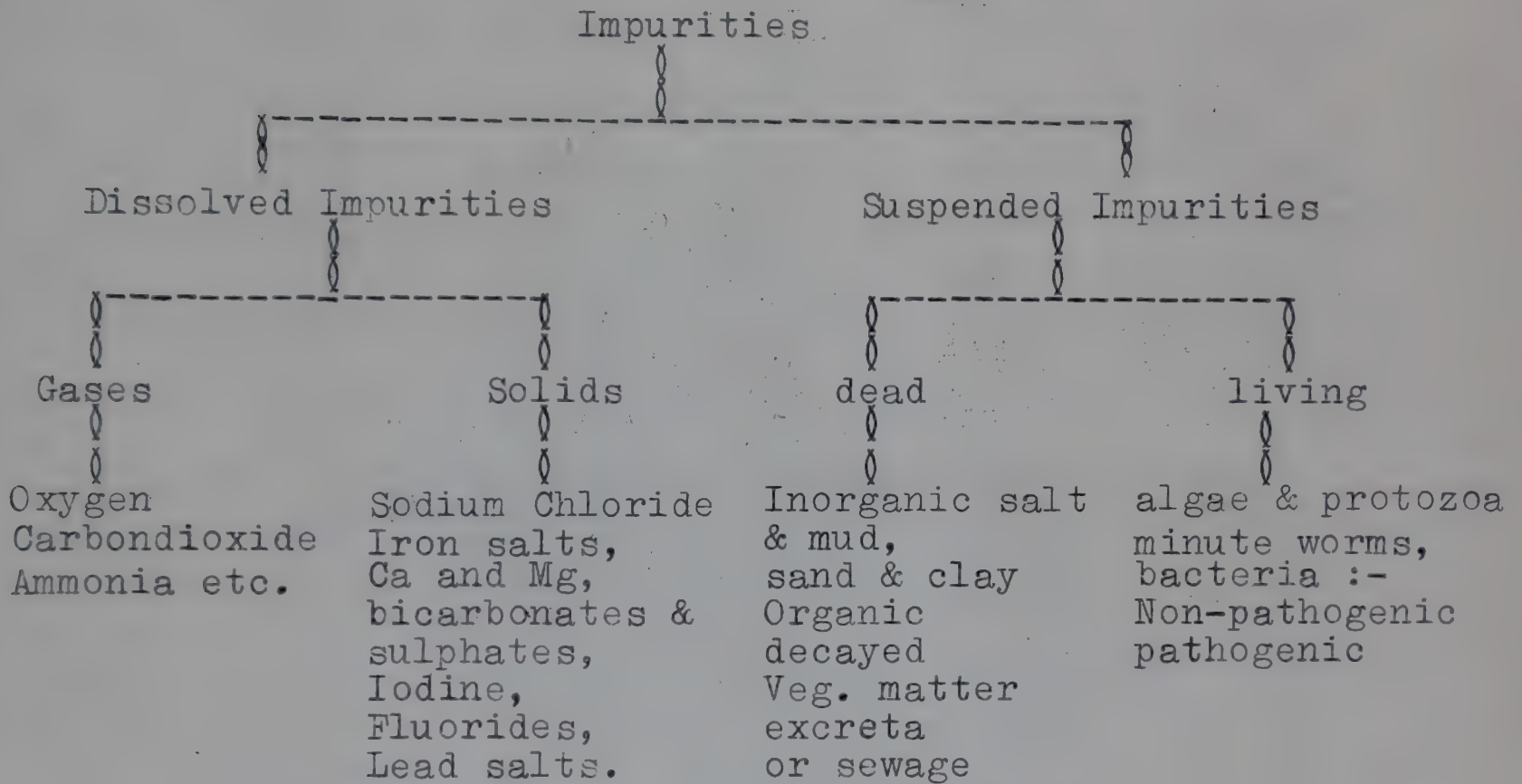
A comparatively high figure for albuminoid ammonia and oxygen absorbed with absence of chlorides and a low figure for ammoniacal nitrogen indicate (peaty) contamination.

Below is given the results of chemical analysis of some waters:

	A	B	C	D
	Ppm			
Total solids	180	450	150	300
Total hardness	90	250	30	200
Chlorine (from chlorides)	10	60	7	30
Ammon. Nitrogen	0.01	0.22	0.01	0.02
Albuminoid Nitrogen	0.02	0.14	0.22	0.05
Oxygen absorbed (4 hrs)	0.01	1	1.6	1
Nitrites	Absent	Trace	Absent	Absent
Nitrates	0.01	8	0.1	5

A = good water; B = sewage contaminated; C = peaty (vegetable) contamination; D = limits for surface waters.

Impurities in water: Water contains some impurities. Some of these impurities are useful for health while others are harmful. The impurities may be classified as follows:



Harmful impurities may be inorganic or organic. The most so dangerous organic impurities are those due to sewage (or human excreta) pollution. Sewage decomposes with time and certain products of decomposition can be detected by chemical tests.

Bacteriological Examination:- This is to find out contamination of organisms of enteric, cholera etc. Water normally contains many natural bacteria, soil bacteria and sewage bacteria. Sewage bacteria are from intestines of men and animals - such as foecal coliform group, foecal streptococci, Cl. Welchii.

Collection of Sample:- Collection in sterile bottles of 8 oz capacity. Analysed within 2 to 3 hours. If delayed, bacterial content changes and false pictures presented. (Kept in fridge if need by delayed).

Examination

- (a) Plate Count:- 1 cc of three decimal dilutions of water (1:10, 1:100, 1:1000) is mixed with 9 cc of agar, cooled to 45 deg. C and plates are prepared. The plates are incubated - one set at 22 deg.C for 3 days and the others at 37 deg.C for 2 days. The number of colonies multiplied by the dilution factor gives the plate count/cc.
- (b) Presumptive Coil Test: Mac Konkey's bile broth with Dunham's tube is used (a) one 50 cc double strength medium is inoculated with 50 cc of water (b) Five 10 cc double strength medium with 10 cc of water in each (c) Five 5 cc single strength medium with 0.1 cc of water in each. These are incubated at 37 deg.C for 48 hours. Those showing acid gas formation are noted and the number of organisms read from Mc Cardy's Table.
- (c) Differential Coliform Test:- To determine whether the Coliform organisms are foecal Esch: Coli or not, sub-cultures are made in Mac Conkey's plate from those tubes which showed formation of acid and gas. Plates are incubated for 24 hours and pink Colonies picked up and tested for fermentation reaction.

Bacterial examination is done in appropriate manner for other organisms like strep: foecalis Cl. Welchii etc.

Interpretation of results

Is in relation with rainfall, source of supply etc.

In the viable on plate count there should not be more than 100 Colonies/cc. A count of 1000 Colonies/cc. is suspicious.

In the presumptive Coliform test the standards are as follows:-

<u>Count of</u> <u>Esch: Coli</u> <u>in 100 cc.</u>		
Class I	Less than 1	Highly satisfactory
Class II	1 - 2	Satisfactory
Class III	3 - 10	Suspicious
Class IV	More than 10	Unsatisfactory

MALNUTRITION

Malnutrition has been defined as "a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients, this state being clinically manifested or detected only by bio-chemical, anthropometric or physiological tests".

Four forms of malnutrition have been distinguished.

(i) Under-nutrition: This is the condition which results when insufficient food is eaten over an extended period of time. In extreme cases, it is called starvation.

(ii) Over-nutrition: This is the pathological state resulting from the consumption of excessive quantity of food over an extended period of time. The high incidence of obesity, atheroma and diabetes in western societies is attributed to over-nutrition.

(iii) Imbalance: It is the pathological state resulting from a disproportion among essential nutrients with or without the absolute deficiency of any nutrient.

(iv) Specific deficiency: It is the pathological state resulting from a relative or absolute lack of an individual nutrient.

Classification of Nutritional Diseases:

The WHO Expert Committees on Nutrition (1962, 1971) proposed the following classification of nutritional diseases:

I. Nutritional Diseases :

(A) HYPOALIMENTATION :

1. Protein-calorie Malnutrition (PCM)

- (a) Kwashiorkor
- (b) Nutritional marasmus
- (c) Severe PCM, unqualified
- (d) Moderate PCM, unspecified

TM-200

- (e) Other PCM
- (f) Malnutrition, unspecified
- (g) Nutritional dwarfism

2. Mineral deficiency

- (a) Iodine
- (b) Fluorine
- (c) Selenium
- (d) Calcium
- (e) Others

3. Vitamin deficiency

- (a) Vitamin A deficiency
- (b) Thiamine deficiency
- (c) Niacin deficiency
- (d) Ariboflavinosis
- (e) Deficiency of other B complex vitamins
- (f) Ascorbic acid deficiency
- (g) Vitamin D deficiency
- (h) Sprue
- (i) Vitamin K deficiency
- (j) Vitamin E deficiency

4. Other Nutritional deficiencies

- (a) Essential fatty acid deficiency
- (b) Individual amino acid deficiency
- (c) Other states and unspecified

(B) HYPERALIMENTATION :

- (a) Obesity
- (b) Hypervitaminosis A
- (c) Carotenaemia
- (d) Hypervitaminosis D
- (e) Fluorosis
- (f) Other

(C) FOOD TOXICANTS :

- (a) Lathyrism
- (b) Epidemic dropsy
- (c) Aflatoxicosis

II. Diseases of the Blood and Blood Organs :

(A) PERNICIOUS ANAEMIA :

Subacute combined degeneration

(B) NUTRITIONAL DEFICIENCY ANAEMIA :

(a) Iron deficiency anaemias

(b) Other deficiency anaemias (folic acid, Vitamin B₁₂, Vitamin B₆, protein)

(C) INDICATORS OF MALNUTRITION :

It will be useful to bear in mind the following "indicators of mal-Nutrition" while assessing the nutritional status as well as evaluation of nutritional programmes in a community.

1. Statistical :

(a) the mortality in the age-group under one year (especially 6-12 months).

(b) the mortality in the age group 1-4 years.

(c) the ratio of deaths of children less than 5 years of age to total deaths.

2. Anthropometric :

(a) the weight of the newborn.

(b) the percentage of newborn weighing less than 2,500 grams.

(c) the height and weight of children aged up to 5 years.

(d) the average weight of 7-year old children entering school.

(e) The index weight/height is regarded as a simple and reliable indicator of the nutritional status of pre-school children in a community. An index of 0.15 has been used as a dividing line between well-nourished and mal-nourished children.

3. Clinical :

- (a) the number of cases of mal-nutrition admitted annually in hospitals and health centres.
- (b) diagnosis of individual nutritional deficiency diseases.
- (c) the proportion of pregnant women with less than 10 g of haemoglobin per 100 ml of blood in the last trimester of pregnancy.

4. Dietary Examination :

- (a) Intake of calories, proteins and other nutrients
- (b) Studies of dietary habits.

Degrees of Mal-nutrition:

While studying mal-nutrition in infancy and childhood with special reference to kwashiorkor, Gomez(1955) was able to draw up the following classification by assessing the percentage of underweight in relation to average:

- 1. First Degree Mal-nutrition : Weight between 85 and 75 per cent of the theoretical average for the age.
- 2. Second Degree Malnutrition : Weight between 75 and 60 per cent of the theoretical average for the age.
- 3. Third Degree Mal-nutrition : Weight below 60 per cent of the theoretical average for the age.

Protein-Energy Malnutrition (PEM)

PEM can be defined as a range of pathological conditions arising from a deficiency of protein and energy, and is commonly associated with infections. It occurs more frequently in infants and young children but is

also observed in adolescents and adults, mostly lactating women, especially during periods of famine or other emergencies.

PEM covers a wide spectrum of pathological conditions, the extremes being nutritional marasmus and kwashiorkor (4, 5). In practice, a large proportion of PEM cases occupy an intermediate position and are referred to as "marasmic kwashiorkor". The definitions of nutritional marasmus and kwashiorkor are as follows:

Nutritional marasmus: A condition characterized by very low body weight for age, loss of subcutaneous fat, gross muscle wasting, and absence of oedema. It is observed more frequently in infants and very young children.

Kwashiorkor: A condition characterized by oedema and low body weight for age. The following signs may be also present but are by no means universal or very marked : muscle wasting, dermatosis, hepatomegaly, hair changes, diarrhoea, and mental changes. The serum albumin level is low. The syndrome is most frequently observed in children aged 1-3 years and is precipitated by an infection or more commonly by a series of infections occurring successively or concurrently.

The manifestations of severe PEM vary widely according to the nature of the causative factors, the time for which they operate, and the age of the patient. Moreover, a child with nutritional marasmus may develop marasmic kwashiorkor and a child with marasmic kwashiorkor may present a picture of nutritional marasmus after the

oedema subsides. From the public health point of view, it is often more convenient not to emphasize the distinctions but to use the more general term "protein-energy malnutrition". There has been a tendency in the past to under-estimate marasmus and to focus attention on kwashiorkor. It is now recognized that the proportion of marasmic children in the world is increasing steadily, especially in urban and periurban areas.

Besides, the children suffering from the most severe forms of protein-energy malnutrition-namely, kwashiorkor, marasmic kwashiorkor, and marasmus a much greater number display a moderate or mild form of this type of mal-nutrition. The main characteristics of these children is that their weight for-age and weight-for height ratios are low in comparison with those of well-nourished children.

Finally, some children may have a low weight-for-age ratio while their weight-for-height is normal. Although these children are small for their age, there is no apparent sign of actual malnutrition because of the more or less proportionate decrease in body dimensions. The term "nutritional dwarfism" has been used to describe this condition.

Protein-energy malnutrition results from the interaction of several factors, among which two are more or less directly responsible for the disease and act synergistically. They are (1) a quantitatively insufficient and qualitatively inadequate dietary intake, and (2) infectious processes such as gastrointestinal and respiratory infections and infectious diseases of childhood (11, 12).

PRINCIPAL FEATURES OF PROTEIN-ENERGY MALNUTRITION

Features	Marasmus	Kwashiorkor
Essential features		
(1) Oedema	None	Lower legs, sometimes face, or generalized
(2) Wasting	Gross loss of sub-cutaneous fat, "all skin and bone"	Less obvious; sometimes fat, blubbery
(3) Muscle wasting	Severe	Sometimes
(4) Growth retardation in terms of body weight	Severe	Less than in marasmus
(5) Mental changes	Usually none	Usually present
Variable features		
(1) Appetite	Usually good	Usually poor
(2) Diarrhoea	Often (past or present)	Often (past or present)
(3) Skin changes	Usually none	Often, diffuse depigmentation; occasional, "flaky-paint" or "enamel" dermatosis
(4) Hair changes	Texture may be modified but usually no dyspigmentation	Often sparse-straight and silky; dyspigmentation-greyish or reddish
(5) Moon face	None	Often
(6) Hepatic enlargement	None	Frequent, although it is not observed in some areas

Contd ...

Features	Marasmus	Kwashiorkor
Biochemistry/pathology		
(1) Serum albumin	Normal or slightly decreased	Low
(2) Urinary urea per g of creatinine	Normal or decreased	Low
(3) Urinary hydroxyproline index	Low	Low
(4) Serum free amino acid ratio	Normal	Elevated
(5) Anaemia	May be observed	Common; iron or folate deficiency may be associated
(6) Liver biopsy	Normal or atrophic	Fatty infiltration

SOME CHALLENGES IN HEALTH ADMINISTRATION

by .

Dr. K.N. Rao

Administration may be defined as the management of public affairs with the use of well thought out principles and practices and rationalised techniques to achieve certain objectives as distinguished from the executive or political function of policy making. Administration is involved in all fields of human endeavour where there is a planned effort. Health Administration as a branch of public administration deals with matters relating to promotion of health, preventive services, medical care, rehabilitation, the delivery of health services, the development of health manpower and the education of the health professions. Administration is the force which lays down the objects which an organisation and its management are to strive and the broad policies under which to operate. Health organisation is a combination of the necessary personnel, facilities and tool equipments brought into systematic and effective correlation to accomplish the desired object. Management is the force which leads, guides and directs the organisation or institution in the accomplishment of the desired objectives.

DEVOLUTION OF HEALTH RESPONSIBILITY: NATIONAL, STATE, ETC.

The organisation of Health Administration in our country is governed by the distribution of responsibility between the centre and states. Health is largely the sphere of State Governments. The Central responsibility consists mainly of policy making, planning, guiding, co-ordinating and evaluating besides the subjects in the

concurrent list; Control of infectious diseases, mental health, social insurance; etc. The Central Council of Health constituted under an executive order of the President consisting of State Health Ministers under the Chairmanship of the Union Health Minister provides a mechanism of consultative joint action for health planning and health policy decisions. At the Centre, the Ministry of Health as in other departments is headed by a Cabinet or Minister of State with the Secretary in-charge of the department. The Director General of Health Services is the Chief Technical Adviser to the Government and is incharge of the Directorate. With the creation of the department of Family Planning, the post of Commissioner for Family Planning is created in the Department. In the State, the pattern is similar. Minister, Secretary and Director of Health Services or Directors of Departments. Both at the Centre and State, the Technical expert has not much say in the final decision making process, notwithstanding the recommendations of the Bhore Committee, the Health survey and Planning Committee and the Administrative Reforms Committee.

The next unit of Health Administration is the District Health Organisation headed by a Chief Medical Officer/District Medical Officer supported by deputies for health and family planning. He has supervisory as well as advisory functions over Zilla Parishad and Panchayat institutions.

At the peripheral level Panchayat Raj functions with the powers given under democratic decentralisation

in the community development blocks. The primary health centre offers integrated health services with sub-centres staffed by an ANM for 10,000 population. Municipalities and Corporations have their own local health departments.

Health Services are supplemented by the independent medical profession in private practice, the mission and voluntary health agencies giving various grades and types of services to the people. There is a large body of medical practitioners of other systems of medicines Ayurveda, Unani, Siddha, Homeopathy, etc. besides the unqualified practitioners of modern medicine that render service to the needy. There are separate Directorates for Indigenous systems of medicine in many states. The Medical Council of India Act has been duly amended to prevent prosecutions of unqualified practitioners.

During the last 25 years, in the various five year plans, great achievements have been made in manpower development, establishment of primary health centres in community development blocks, in the control of communicable diseases, improvement of environmental sanitation and provision of water supplies and family planning services. However, neither the bed population ratio, nor the doctor population ratio or the rural urban ratio of manpower resources and health institution facilities have been encouraging.

SOME CHALLENGES IN HEALTH ADMINISTRATION.

Concept of Health: In the preamble to the Constitution of the World Health Organisation, health has been

defined as a "State of complete physical, mental and social well being and not merely the absence of disease". "The enjoyment of highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic and social condition". To achieve these, planning the delivery of Health Care Services, the provision of requisite manpower and the education and training of the health professions have to be taken up.

Integrated health services have been advocated during the last quarter of a century from the time of the report of the Bhole Committee (1946). A recent NIHA study of integrated health services in India in the states of Uttar Pradesh, Maharashtra, Punjab, Rajasthan, Andhra Pradesh, Mysore, etc. has shown that the type of integrated services in position is far from being satisfactory. Changes are required in the training of the medical student in the college, in the orientation of the medical officer at the primary health centre and the attitudes and outlook of the administrative personnel at the state, district and PHC level to make the concept of integrated health service a reality. The realisation of the concept of comprehensive health care through integrated health services is one of our major challenges in Health Administration today as the gap between knowledge and its application is widening.

Population and challenge of Poverty: With the introduction of the miracle drugs and National eradication programmes mortality rates have fallen considerably while maintaining high birth rates, resulting in rapid population

growth which has become a major public health hazard. Not only there is low per capita income, but also about 40% of rural and 50% urban population are below poverty line. Poverty-disease, poverty-infant and child mortality/morbidity-population pressure is the chain of vicious cycle with cumulative causation of increased poverty, nutritional deficiency and frequent and numerous pregnancies. The obstacles to the acceptance of family planning require integrated programme viz., the extension of MCH services, Immunisation and Nutrition programme and health education.

This challenge of population pressure with the socio-economic and health consequences has to be met by Health Administration as a priority. In the provision of total health care to a population, Health Administration has an equal responsibility in fertility control.

Infant and Child Mortality: About 41% of the population (1961) was under the age of 14. Out of the total mortality of 9 million per annum, about 47.3% of it occurs in the group below the age of 15. The proportion of children (1961) under the age of 1 was 3.78% with 28.3% of age specific death rates; and under the age of 5 the population was 12.6% with 13% deaths. In the Khanna Study, it has been shown that 57% of deaths below the age of 1 were in 3rd para and above. The importance of reduction of this mortality to assure the survival of the existing children for the acceptance of family planning need no further emphasis. Integrated programmes of child care, nutrition for pregnant women in the last trimester and children below 2 years, literacy and family life

education are the need of the rural population. To achieve small size family norm is a challenge to Health Administration.

Education, Training-Orientation: The education of the physicians of today is incomplete, inadequate and unsatisfactory to meet the needs of the society. Also social sciences do not figure in the curriculum. The basic sciences, clinical sciences and community medicine departments instruct the students in isolation whereas multi-disciplinary teaching and an effort to approximate the educational aims and outcomes of medical education are the needs of the society. The training of the other members of the health professions is equally inadequate to meet the needs of rural India. Training the entire team in a rural setting is a great need.

The training of the health administrator and the orientation of every new entrant to service therefore becomes important. The excellent courses of training at the NIHAIE require to be replicated in each state so that as many of the health workers as possible get oriented to principles of Health Administration in the shortest possible time. In this, the management techniques involving personnel management, budgeting and financial control, planning and programming, research, reporting and public relations, legal and other administrative procedures and practices and health education techniques should be given emphasis. The case method of dealing with problems in the training of administrators need introduction.

Training in public administration should include Federal Government, State Government, organisation theory and administrative management.

Evaluation and Research: Evaluation of the existing procedures and service arrangements require periodic study for feed back. Research areas in health practices in many aspects of the broad spectrum of Health Administration require support. Studies at NIHAIE on patient satisfaction and ward social system and motivation training for mental health are excellent examples of social research in the field. Community health studies are another group of health practice studies. Operational research in the day to day working of hospital clinics, health centres, health administration units will yield great information for effecting improvements of health services administration. Epidemiological and ecological studies are of great value. Systems analysis studies give clues to many lacunae. These are some challenge areas in Health Administration.

Some obstacles to good health administration: In all developing countries including India, there are many factors common and inherent in the administrative practices that retard good health administration.

Unlike advanced countries there is no pool of experienced and well informed leaders of thought available as potential leaders for Ministerial positions which greatly handicaps their assuming policy making and decision making responsibilities in the Government. This results

in over dependence on the Secretaries who are non-technical general administrators. Further there is a tendency on the part of policy makers to assume executive powers which are the duties of either the permanent secretary or the Head of the Department resulting in much discomfiture and indiscipline in the organisation.

The general administrator of the past and even the present in training accustomed to the maintenance of law and order and not trained for development activities and welfare economics, have the last word even on technical matters. It is not an uncommon feature in the Ministry where question of health promotion/prevention and control of communicable diseases, technical education of the health professions, diagnostic and curative medicine are considered, decisions are taken by local finance and the secretariat staff against the advice of technical experts. Non-fulfilment of plan targets, reintroduction of communicable diseases are the results of some of these decisions. Under the circumstances there will not be much hope on the horizon before the recommendations of Administrative Reforms Committee are accepted.

The technical health administrator has the above double disadvantages in the states and sometimes at the Centre which greatly impedes the proper execution of his responsibilities. The many recommendations of the Bhore Committee, the Health Survey and Planning Committee and the Administrative Reforms Committee to make the technical expert as the Secretary or Additional Secretary to the Department have all been of no avail so far. Till the

dawn of such an event, the Health Administrators should equip themselves both technically and administratively for organisational and managerial responsibilities.

The place of social sciences i.e. Sociology, Psychology, Health Economics, Anthropology, Political Science and Biostatistics, in the re-education and training of the Health Administrator is important. During the last quarter of the 20th century, there will be a great need for health administrators of versatility and knowledge to manage obstacles that come in the way, and to give an impressive development.

Financial Regulations and Rules: Continuation of the past financial regulations of the British times is detrimental to progress. Certain items require reapproval by finance which not only delays but also gives opportunity to veto planned development.

Participation of the People's representatives and the people: There is conspicuous lack of participation of the professionals, voluntary organisations and the people in development activities. The existence of the bureaucracy, the ignorance of the masses and the absence of knowledge of global trends in decision makers all are largely responsible for this situation. Health education and welfare are a community effort in a democracy, the Government, the profession, voluntary organisations and opinion leaders and so people should work together. Health Administration should take up the need to cut across red tape and surmount obstacles and create the necessary means of co-operation for development.

Welfare State: The aim of our Government is to usher a welfare state. In a welfare state, there will be no place for the five giants - poverty disease, ignorance, squalor and idleness. It has been estimated that about 240 million people in our country (40% of the rural and 50% of the urban population) are below the poverty line (with less than Rs.20 a month). They are in want; they live in squalor; they are ignorant and illiterate; they are disease ridden and they are unemployed and under-employed. Their culture of poverty perpetuates itself for generations notwithstanding our efforts to offer family planning facilities. This is a challenge of the highest priority to all Health administrators as the health and welfare of this segment of population will decide whether we are on the road to progress or not.

Lack of Health manuals, civil medical and public Health codes and standardised health practices: The lack of upto date instruction manuals and standing orders for members of the health professions in the services is a great drawback. Procedure is the physiology of an organisation. Health Administration at the National, State, local levels must conform to the directive principles of the State Policy in the Constitution of India, and our plan documents so that there is no divergency in our social aims and administrative procedures. Procedures-institutional and working--should be clear and concise so as to get over the red tape of procedure pathology which is prejudicial to development and efficiency.

NEW TRENDS IN HEALTH ADMINISTRATION:

Administrative theory is concerned with the behaviour of the people called administrators and managers in health Administration viz., Superintendents of Hospitals, Medical Officers at the State, District and Block levels, Principals or Heads of Teaching institutions. These administrators are authorities and are accountable and responsible not only for their actions but also for the actions of others working under them. In the administrative units there is structure, a pattern of relationships reflecting the distribution of authority and responsibility and the machinery of planning, co-ordination and control. Delegation of authority or decentralisation to the extent that is possible, consistent with efficiency and economy, helps development. Administrators working in a dynamic environment need to have ability both to be involved and at the same time to be out of it. The administrator should also develop all the skills needed for community diagnosis, and abilities for problem solving and decision making. In Health Administration, as in other branches of public administration, the problems of decentralisation and specialisation requires attention.

Health Administration is a multifaceted and multidisciplinary process. It is a speciality on its own right. Even though every physician deals with administration to some extent or other there is need for administrators to be educated and trained in the speciality, to develop the art of administration, and organisation

and initiated in the scientific principles of management. The challenge in the last quarter of the 20th century is not only to general Administrators but also to Health Administrators who contribute to health, happiness and humanity. One may agree with Brook Adams that the function of administration "is to facilitate social change and to cushion the shock of revolution". Let Health Administration as an agent of social change take up the challenge to fulfil its mission!

ASSESSMENT OF NUTRITIONAL STATUS OF A COMMUNITY

The nutritional status of a community is the sum of the nutritional status of the individuals who form that community.

Types of Survey:

1. Longitudinal
2. Cross Sectional

Elements of Nutritional Assessment:

- I. Clinical Examination
- II. Anthropometric Examination
- III. Biochemical Examination
- IV. Laboratory Examination
- V. Dietary Examination
- VI. Study of Vital Statistics
- VII. Assessment of Ecological Factors

I. Clinical Examination:

1. General : Normal built/Thin built/sickly appearance :
2. Hair : Normal/dull and dry/dyspigmented/thin and sparse/easily pluckable/flag sign
3. Face: Diffuse depigmentation/naso-labial dyssebacea/moon face
4. Eyes : Conjunctiva-normal/dry on exposure for 1/2 min/dry and wrinkled/bitot's spots/brown pigmentation/angular conjunctivitis/pale conjunctiva Cornea-normal/dryness/hazy or opaque.
5. Lips : Normal/angular/stomatitis/cheilosis
6. Tongue : Normal/pale and flabby/red and raw/fissured/geographic
7. Teeth : Mottled enamel/caries/attrition
8. Gums : Normal/bleeding
9. Glands : Thyroid enlargement/parotid enlargement

10. Skin : Normal/dry and scaly/follicular hyperkeratosis
11. Nails : Koilonychia
12. Oedema : in dependent parts
13. Rachitic changes : Knock-knees or bow legs/opiphyseal enlargement/ beading of the ribs/pigeon chest
14. Internal Systems : Motor weakness/Haepatomegaly/psychomotor change/mental confusion/sensory loss/loss of position sense/loss of vibration sense/loss of ankle and knee jerks/calf tenderness/cardiac enlargement/tachycardia.

II. Anthropometric Examination:

1. Weight (kg)
2. Height (cm)
3. Mid-upper-arm circumference (cm)
4. Head circumference (cm)
5. Chest circumference (cm)
6. Skin fold - Tricepes, subscapular, paraumbilical
7. Calf circumference

Composite indices:

1. $\frac{Wt}{(Ht)^2} \times 100$
2. $\frac{\text{Arm circumference}}{\text{Head circumference}}$
3. $\frac{\text{Calf circumference}}{\text{Height}}$

III. Biochemical Examination:

1. Protein :- Total serum-protein
Serum albumin
Urinary urea

2. Vitamin A :- Serum Vitamin A
Serum carotene
3. Vitamin C :- Serum ascorbic acid
Urinary ascorbic acid
4. Vitamin D :- Serum alkaline phosphatase
in young children.
5. Thiamine :- Urinary thiamine
Blood pyruvate
6. Riboflavine :- Urinary riboflavine
7. Niacin :- Urinary N-methyl nicotinamide
8. Iron :- Haemoglobin Serum iron
9. Iodine :- Urinary iodine
Tests for thyroid function

IV. Laboratory Examinations:

1. Haemoglobin : (specify method)
2. Stool : negative/ascariasis/ancylostomiasis/
giardiasis/amoebiasis/strongyloides/
others (state) :
3. Blood smear : negative/M.T./B.T./Filaria

V. Dietary Examinations: (see attached Diet Survey schedule)

1. Weighment of raw foods
2. Weighment of cooked foods
3. Oral questionnaire method
4. Checking of stock inventory

VI. Study of Vital Statistics

1. Infant mortality rate
2. Neonatal mortality rate
3. Still Birth rate
4. Perinatal mortality rate

5. mortality for (1-4) years group
6. Life expectancy
7. Hospital statistics

VII. Assessment of Ecological Factors:

1. Conditioning influences
2. Cultural influences
3. Food production
4. Socio-economic factors
5. Health and educational services

HEALTH TEAM LEADERSHIP

by

Dr. H.S. Gandhi

The need for a comprehensive approach to human problems and for co-ordination and collaboration between various categories of health workers under-scores the concept of team delivery of comprehensive health care. There are hospital based teams for inpatient and outpatient care. Their tasks and goals are relatively clear, their success is measurable; social considerations are of seldom importance in such teams and decision making is through a clear cut hierarchy. On the other hand, we have primary health care teams having extended responsibilities towards community health besides individual patient care. The care through such teams is general, continuous and inclusive which means these teams cannot ignore social problems and the emphasis is not purely medical and curative. However, both these forms of health teams (also several other forms) are examples of group activity (group practice) where physicians, excepting some forms of macro teams, have logically to perform the team leadership roles.

Groups have their internal processes of work and external relationships to achieve given tasks. Relating this concept to health team functioning particularly at the primary health care level the principal questions of leadership are not merely confined to co-ordination and collaboration between various members of the team but greatly extend to other areas of group dynamics such as decision making, communication and leadership patterns,

supervision, direction etc. In terms of external factors, the leadership has to take into account organisational issues of not only the team itself; the roles, the tasks, division of labour between different team members and their placement in the team hierarchy but also its own place in the bigger organisation of which it is a part. Besides, there are questions of technical direction, public relations, further development of its staff members and developing linkages with other health care sectors and referral support.

Beckhard* has documented major functional problems described by the Director of a Community Based Health Centre as under:-

"Health care is delivered to the families in the community through health teams composed of physicians, nurses and community-based and center-trained family health workers. We are having a lot of difficulties in the operation of the health teams. Some of the reasons are the different backgrounds represented on each team, the cultural differences among the members, the difficulty in getting some doctors to function as colleagues with other types of health workers.

We have problems about the role of the public health nurse in these teams. She is assigned as the co-ordinator and leader of the health team but this is a very strange role for her.

*Beckhard R: Organisational issues in the team delivery of comprehensive health care, the Milliank Memorial Fund Quarterly, Vol.L No.3, Part I, July 1972.

We have a lot of communication difficulties between the community-oriented family health workers and the more highly professionally trained physicians.

We are having a number of problems with supervision, particularly first-line supervisors who are mostly community residents whom we have trained.

We are having a lot of difficulty around information flow and record keeping. Patient records are often incomplete and in the wrong place at the wrong time. A number of referrals get lost between departments and between the centre and the hospital.

Another problem for me is that the top team doesn't function very much as a team. Each functional head of department such as pediatrics or obstetrics has reporting to him his functional counterparts on the delivery teams. He tends, naturally, to be more concerned with the carrying out of his particular functional area than with the overall management of the centre. This makes it difficult to get best decisions for the whole organisation.

We are pretty sure that we are not properly organised structurally to manage this operation, but we are not sure how to go about changing it".

The Conditions Causing these Problems: To adequately define the problem Beckhard advises to look at the environmental situation. Two "environments" or "systems" are inter-acting. The patient system with its problems, desires and needs interacts with the health care delivery system, which is composed of a variety of sub-systems: medical practitioners, community development workers,

social workers, educators and administrators. An analysis of these systems in a needy community brings out the following:

1. The patient system is highly complex. The patient families are composed of individuals with a variety of physical, emotional and social problems. They present a varied set of needs for service in terms of disease, treatment, maintenance of health, health education, improvement in living conditions etc. They also have a variety of expectations of the health centre staff to fulfil those needs. In addition, they expect leadership role in dealing with their social problems.

2. The health care delivery system (the primary care health team plus backup teams of medical and social specialities) is usually composed of a variety of specialists who are trained to deal with one or at most a few of the types of needs and expectations of the patient system.

3. The health problems of the patient system tend usually to be interdependent and complex.

4. Servicing these complex problems requires capabilities in many areas: evaluating health problems; diagnosing disease causes; treatment of medical problems; diagnosing and evaluating social and economic problems; treating social problems by legal or social action; maintaining a new condition for a family.

5. The total services needed cannot be effectively delivered by assigning parts of the problem to specialists

on the delivery team trained to treat those parts. Integrated effort is required among a number of different health workers to treat the complex problems in the family patients.

6. It is necessary for all health workers on a team to:

(a) understand the total complex of health problems of their patient families;

(b) understand the patient's (family's) needs, attitudes expectations and values;

(c) be able to jointly assess what resources (members of the health team) can best be deployed for diagnosis, treatment, health maintenance and education of the patient families.

Leaders' Role: Given the variety of different needs and expectations of patient families; the variety of educational, technical and social backgrounds of the medical and social health workers; and the necessity to have integrated team diagnoses and treatment of the inter-related medical and social problems in patient families, the major problems are how the organisation leadership can:

1. Help the primary care teams integrate their diagnosis and treatment of the complex problems of their patient populations.

2. Provide an organisation structure that reflects current work requirements.

3. Deal with the human problems caused by the situation where a variety of roles (physician, nurse, family health worker) have to collaboratively perform a variety of tasks, many of them new.

4. Locate authority and develop competence so that decisions are made by those with the best information and by those closest to the problem.

5. Build an information system and communication patterns that assure that all health workers have best available information.

6. Build linkages between the practitioners (primary care teams) and the support system (all others).

7. Develop education and training programmes that assure:

(a) adequate dissemination of clinical content to a variety of health workers;

(b) dissemination of content about the social conditions of patient families and the community culture to medical practitioners.

(c) develop training in skills of group membership for a variety of health workers;

(d) provide adequate training in leadership and supervision for health team leaders, medical administrators and medical practitioners.

8. Maintain a patient-oriented delivery system in a situation where there are strong forces to mass produce the care.

9. Keep a staff with a variety of different backgrounds and values motivated and working together.

Given this set of problems and responsibilities, the health team administrator needs working mechanisms to achieve the goals or missions set for the team. As a team leader, his role has accentuations in the management of the internal processes of the team more particularly in primary care health teams where there are relative uncertainties of clarity of goals and roles and lines of authority and because of the diverse mix of skills represented on such teams.

In our own situation, it has been observed that apart from cultural, professional and training differences of various members of community based health teams affecting their effectiveness, the issues of co-ordination, supervision, and job descriptions and allocations of various workers do not receive adequate attention in the hands of our team leaders, otherwise, powerful internal factors for good team building and functioning. Usually, it is not possible for them to greatly influence the external factors affecting team functioning, such as the policy and organisation frames of the main health services organisation, its staff development policies, financial management etc. For them rewards are, therefore, located in improving the group dynamics of their own compact unit teams. Health team leadership should, therefore, be itself trained in the behavioural and management aspects to handle the complex health problems in the field and their own organisations, in addition to training for technical supervision and guidance which due to specialisations may have limitations.

STATISTICS IN HEALTH

by

Dr. K.K. Mathen

Application of statistical methods to health science can be considered from two points of view--the health of an individual and the health of the community. Numerical data are useful when determining the health of an individual and describing the health status of a population. Inferences based on statistical data have greater scientific value than those based on opinions without the support of statistics.

Statistical methods are applicable at three stages viz; when collecting statistical data on any problem, when analysing the data and lastly, at the time of drawing inferences based on the statistical data. A basic problem in the field of health science is to determine the health status of an individual person or describe the health condition of a population consisting of a group of persons. In the former situation, a physician is interested to classify a person into one enjoying normal health or one suffering from disease or a number of diseases. In the latter situation, the health scientist desires to describe or summarise the health status of a population as normal or abnormal with particular reference to some disease or any specific health problem, say an epidemic. In both these situations, one has to define the normal condition. To describe the normal condition of health of a human being, statistics on various physical, physiological and other factors are necessary. Similarly, to describe the normal

health conditions of a population statistics on multiple factors are necessary.

The fundamental sources of obtaining statistical data, so far as individual health is concerned are (a) institutional records (b) private physicians' records and (c) adhoc studies on specific problems. The methods of statistical data on public health are generally of four types (a) census enumeration (b) registration of vital events and cases of specific diseases which are registrable by special laws (c) records maintained by individuals or institutions and (d) adhoc studies on specific public health problems.

Descriptive statistical techniques are applied on health data when defining a disease condition as distinguished from normal condition. A physician can make use of these techniques to assess the health condition of a patient and a health administrator needs them to prescribe the health status of a population at a certain time.

Different types of statistical techniques are used for various inferences to be drawn on health data. For example (a) an administrator wishes to infer the health condition of a population by the study of a sample, (b) he wants to forecast the future of the community health from the data of the past, (c) he likes to pinpoint the factors responsible for a specific health problem and (d) he wants to assess the effectiveness of a new treatment compared to an old one.

Accuracy and comperability of health statistics:

Before applying the standard statistical techniques on health data, one should examine the accuracy and completeness of the data. If the data do not satisfy certain minimum standards of accuracy, the inferences drawn from the data will be misleading. The vital statistics of most populations generally suffer from the defect of incompleteness because births, deaths and marriages taking place in a given period are not all registered and the percentage of these vital events registered differs from place to place and year to year. Under these circumstances inferences made on these incomplete data are often wrong or misleading. When complete data on any aspect of a population are difficult or impracticable to obtain, data can be collected on a sample basis. The choice of the sample must follow certain scientific principles to make the sample representative of the population.

Any one trying to make inferences about the health of a population must have an idea of the degree of errors of measurement involved in the basic data. Absolute accuracy in measurement, observation or classification of health data is an impossibility but if certain standards of uniformity in the procedures of collecting data is maintained gross errors in the final conclusions can be avoided. In many countries, too detailed a classification of diseases and causes of death might be impracticable but by following the principles such as those enunciated in the International classification of diseases, injuries

and caused of death it might be possible to secure uniformity and comparability in the mortality and morbidity data between different areas.

To study the sources of errors of observation, measurement and classification of health variables we may consider the examples of (a) body temperature (b) pulse rate (c) blood pressure (d) nutritional status and (e) chest X-ray reading. A health worker should be aware of the amount of variation which can arise in each of these due to (a) personal differences on observation and taking measurements and (b) normal variation between subjects enjoying the same health status. Among those variables, there is wide variation in both these sources of variation. The variation in the results of the reading by different experts of the same set of X-ray plates are sometimes most surprising. Some examples of these are provided in the Report of National Tuberculosis Survey conducted under the auspices of the Indian Council of Medical Research in 1956. To study the personal variation in taking body temperature, pulse-rate, blood pressure etc. experiments have been designed in which the same set of subjects are simultaneously and independently measured on these aspects of health by different technicians. The results have been subjected to the statistical techniques of the analysis of variance and the results have shown many interesting features (unpublished work at the All India Institute of Hygiene & Public Health).

A very common use of statistics in Health is to establish the norms and on the basis of the established

norms to decide whether a particular persons is healthy or diseased. In defining the health of a human being with the help of physiological variables, description in terms of a central value and arrange of variation is implied. For example, if the healthy person is to be defined in terms of 'body temperature', one has to give a mean value and a range of variation. Different techniques are available to present the normal picture of a health variable such as body temperature, pulse-rate or blood pressure. Empirical method consists in the preparation of a frequency table and estimation of appropriate percentiles based on the data collected through a sample which is representative of the population studied. An alternate approach in the case of a quantitative variable is to calculate the mean and standard deviation of a representative sample of observations and estimate theoretically the appropriate percentiles.

In the case of a qualitative variable such as morbidity rate, mortality rate or fertility rate, all the information required to establish the norm and its normal variation, will be available from the value of the appropriate ration from the past experience and the size of the population (the standard error for a ratio being calculated from the formula $\sqrt{p(I-P)}$, p being the value of the ratio and the size of the sample.

It may be observed that there, the assumption of 'normality' and 'Binomial distribution' have made the task of establishing the 'norms' easier. The study of other standard distributions is also useful in similar

situations as well as making inferences about a population from a sample and when making forecasts about the future behaviour of a population from the past experience.

The most frequently asked questions to a biostatistician are regarding the adequacy of a sample size when (a) conducting a sample survey to estimate the health indices of a population and (b) conducting a clinical trial to determine the superiority of one drug over another. The concept of sampling variation is used in the determination of sample size in the above situations. The theory behind the first problem is rather simple but that of the second is more complex and may not be easy enough to be included in the medical curriculum. Whether a physician is able to do these problems himself or not, it is necessary for him to learn the need for the application of modern statistical techniques in such situations. Few examples are given below to illustrate this.

1. In order to establish the norms of weight for children at specified age, how many children should be weighed and how are they to be selected?

2. In order to estimate the morbidity prevalence rate of disease, how large a sample must be surveyed?

3. A medical practitioner quite often is confronted with a situation when he has to apply a statistical test of significance to the data in his experience. For example, a new treatment for a certain disease when applied to 5 patients gave a cure rate of 80 per cent when compared with a cure rate of 20 per cent to a similar set of patients

who were treated by the old drug. Without the knowledge of statistical theory he may conclude the new treatment much superior to the old one but when an appropriate test of significance is applied it is found that the difference between the two treatments is not statistically significant.

4. An interesting example from surgery is to illustrate the point further. An 'internationally famous surgeon argues for early operation in Choleystitis (inflammation of the gall bladder) on the basis of the following evidence:

<u>Operation</u>	<u>Cases</u>	<u>Mortality</u>
Early	62	3.2.p.c.
Late	92	7.2.p.c.

Two American surgeons later claim the opposite on the basis of their experience:

Early	144	7.6 p.c.
Late	176	3.4 p.c.

It is possible to determine, purely from the point of view of chance expectance, which of the above two claims is justified. It is also important to know in the above situation whether it is justified to combine both the series and arrive at a conclusion on the problem.

In both the above types of problems, lot of statistical theory is involved which a medical student is not expected to know. But the fundamental principle of drawing a random sample and the technique of randomisation

in allotting subjects to different treatments must be clearly understood by him. The fallacies and difficulties when the principle of randomisation is abandoned must be emphasised from medical data.

Application of sampling Techniques to Health Problems:

The health administrator needs reliable information about the health of the whole population he is serving. This involves collection of information from each member of the population and summarising the body of data so obtained. Both these processes are time consuming when the population is large. By surveying a sample of the population according to scientific principles, it is possible to study the population and thereby effect saving in time, labour and money. A few examples in the field of public health where sampling is advantageous are (a) studying the health status of a population (b) determining factors influencing health (c) Implementation of a new health service programme (d) evaluation of the effectiveness of a health programme (e) surveillance of a health situation (f) rapid processing of data and (g) checking the quantity of routine health data.

In India, during the last 30 years, sampling techniques have been applied to study a number of public health problems. Some of the most important sample studies were (a) General Health Survey of Singur Health Centre Area (Lal & Seal), (b) Mysore Population Survey (U.N. & Govt. of India) (c) Short General Health Survey of Community Projects (Seal & Others), (d) Tuberculosis Sample Survey (ICMR) (e) National Trachoma

Survey (ICMR & WHO 1956) and (f) Growth & Physical Development of Children (ICMR 1957).

The experiences of the public health sample surveys in India show that the future of sample surveys will be decided to a great extent by the way in which we shall be able to control and estimate the amount of non-sampling error. A number of studies have been made in India and abroad for estimating the errors of the non-sampling source. To control and detect bias due to investigators Mahalanobis introduced in 1930's interpenetrating sub-sampling which consists in drawing a sample in the form of a number of identical sub-samples which would be allotted to different investigators. Another approach to estimate the errors in detecting vital events from a survey originally introduced by Chandrasekar and Deming (1949) based on investigations in Singur was to cross-examine the survey results with an independent source of information suggesting that of vital registration and using certain assumptions on the correlation between the two sources of information to make an estimate of the number of events missed by both agencies. A third development was Yerushalmy's (1956) method of using multiple readings for radiological diagnosis. This consisted in submitting to a third reader all the films which were interpreted as positive by one reader and negative by the other reader. Various alternative procedures were tested against bacteriological findings, in the National Tuberculosis Survey and the most efficient method of estimation was evolved which in this situation was to accept all films which were classified as abnormal by the central reader, irrespective of the readings of the local readers.

In India, during the last 25 years, number of attempts have been made to conduct a continuing type of health surveys like that of the U.S.A.'s Health Interview Survey. But due to various practical difficulties they have not succeeded. As an alternative to this, it was decided by the authorities of the Indian National Sample Survey to include items of such information. In some rounds of this survey, information on mortality, fertility and morbidity were included. So far, the response from the health administrators to utilize the health information from the National Sample Survey has not been very encouraging. It appears that the utilisation of the data collected by sample surveys conducted by public health workers is also not very different. Perhaps, the most widely used health survey results in India are the reports of the two Health Survey and Development Committees under the Chairmanship of Sir Joseph Bhore and Sir Lakshmanaswamy Mudaliar. Both these surveys gave a lot of useful information on various aspects of the health of nation by methods which are quite different from a sample survey of the population. For example, the former survey (Bhore Committee) has given the morbidity rates from Malaria, Tuberculosis and venereal diseases by interviewing a few experts on the subject such as Col. Sinton, Dr. Benjamin, Dr. Ukil and Sir John Megaw, respectively.

It is worthwhile for us to consider the probable reasons for the wide acceptability of the results of these two surveys which are neither sample surveys nor surveys in the true sense of the term because they have not collected the information based on their opinion and part experience.

(1) An adhoc sample survey on a national scale requires time not only for planning but also for analysing the results of the survey and finally to give a report. Generally, when the report is available to the would be consumers the interest is very much reduced because the data then relate to a time in the distant past. Quite often it takes over 5 years for the results to be published.

(2) As the conclusions of a sample survey are given along with their sampling error, the administrators who are not clear about the significance of the sampling error feel different in using them. Added to this difficulty they are also told that there is another source of error viz. the non-sampling error. When the results of these surveys are associated with a mixture of these two kinds of errors, the confidence in using them is very much reduced. Studies in India have shown that the non-sampling error is generally much higher than the sampling error and they get larger with size of the sample, unlike the sampling error.

(3) In developing countries there is the difficulty arising from public anxiety about what would happen in a general of specific health examination survey people are discovered to be suffering from serious diseases; whether they would get help for treatment, whether they would be considered as outcasts in their society and what would happen to their dependents if wage earners lose their job due to the detection of the disease.

To make sample surveys in public health more popular and effective the WHO Expert Committee on Health Statistics

gave a number of recommendations. They include dissemination of information on problems in planning of sample surveys in public health especially the difficulties encountered in such surveys and errors of non-sampling origin and the provision of facilities for public health workers to obtain basic knowledge of sampling methods and their application in the field of health administration.

Application of modern developments in the design of experiments to Public Health problems:

The Theory of the Design of Experiments makes use of the following principles: (a) the use of a control group to make comparison with the effect produced by a treatment (b) making the control and treatment groups balanced with respect to variables which affect the results of the experiment by various techniques including randomisation in selection, matching, etc. and (c) determination of the size of the experimental subjects to obtain conclusive results. The above principles have been applied as far as practicable in the study of etiology of diseases and to evaluate effectiveness of a health programme. In both these areas, the use of a control group is not always practicable. For example, when testing the effectiveness of a drug in curing a fatal disease like cholera or tuberculosis, medical ethics comes in the way of keeping a 'control group' without any drug. In studying the etiology of a disease as, for example, the role of cigarette smoking in causing lung cancer, it is impracticable to keep a proper control group of non-smokers to compare with a group of smokers. Selecting the groups for 'treatment' and

'control' in such a study by random allotment of volunteers and keeping both the groups under observation for long periods to note the effect of smoking are also difficult in practice. Some of the classical epidemiological studies on the etiology of diseases in which the above principles have been tried are given below:

The dominant thinking in the United States at the time when Goldberger began his investigations on the etiology of pellagara was that the disease was caused by infection from a case. Gathering all the available data on the disease, Golberger wanted to test the above hypothesis with his own alternate hypothesis what the disease was essentially of dietary origin. When John Snow made his investigations on cholera in London and its suburbs in the middle of the 19th century the disease was usually believed to have been caused by a morbid poison coming from dead bodies and decaying organic matter in effluvia and spread through air. Snow started his investigation to test the above hypothesis against his own hypothesis that it was caused by introducing the morbid material producing the disease into the alimentary canal of a healthy person through water he drinks or the food he eats. He postulated that the injections and dejections of cholera patients must be swallowed by healthy persons for the spread of the disease from person to person. R.B.Lal during the thirties of the present century had two hypotheses about the causation of Epidemic Dropsy when he started his investigations in Calcutta on the etiology of this disease. According to one hypothesis the etiological agent was adulterated mustard oil and the alternate hypothesis was the

consumption of 'Opaque rice' (rice which becomes opaque due to storing for a long time).

In the pellagra study, Goldberger took different kinds of 'statistical controls' to find out which was the true one. He first compared the pellagra incidence among the inmates of certain orphanages with the incidence among the nurses and attendants of the same orphanages. After noting that in the second group there was no pellagra whereas in the first group there was high incidence of pellagra he made a second study in which he changed the diet of the pellagra patients with a view to note whether the relapse rate among them would be diminished. When the diet of the patients was changed according to the Goldberger's hypothesis regarding the cause of pellagra the relapse rate of pellagra was reduced to very low level. He also demonstrated that pellagra could be produced in normal healthy people by feeding with diet deficient in certain nutrients.

John Snow in designing his studies on cholera took care to obtain comparable groups to test the two hypotheses on the causation of the disease. Two groups of population he selected for this purpose were the inhabitants of the two courts in Thomas Street during the cholera epidemic of 1849. The people living in these courts were similar in their socio-economic and environmental conditions except for the fact that one group took their drinking water from a well into which dirty water flowed because of the slope of the ground in front of their court. The role of contaminated water supply in causing cholera was further studied by Snow in 1853, when cholera affected London and suburbs again. In this study he compared

he compared the incidence of cholera in two groups of population each of which had its water supply from a different source. Two companies were supplying water to London population at the time. In 1852 one of them changed their source of water from the Lower Thames and began obtaining water free from the sewage of London. The two groups of population served by the two companies were similar in all other respects when the epidemic of 1853 occurred. The incidence of cholera in the two groups was very different.

Lal's Epidemic Dropsy investigation had 12 human volunteers for the feeding trial. These were divided into 2 groups of 6 each, at random. One group was given a certain dose of the 'suspected mustard oil' and the other an equal quantity of pure mustard oil. The two groups were further matched by feeding 3 (selected at random) with 'Healthy rice' and the remaining 3 with 'opaque rice'. The advantages of matching the two groups in this way were twofold. First it enabled the experimenter to balance the two groups with respect to possible covariable viz. nature of rice consumed, other diet consumed etc. Secondly, the design permitted the use of the same set of data for testing the validity of the 'rice theory' and 'Mustard oil theory'.

The Rural Field Study of population control Singur had an experimental area, a statistical control area and a test area. The family planning methods developed by trial and error in the test area were applied in the experimental area. The statistical control area was under observation to interpret the effectiveness of the methods applied in the

experimental area. In the field trial on Salk vaccine for Polio in U.S.A. all the volunteer were divided into two groups. In one group the methods of mass treatment were applied and the other group of towns was kept under observation for comparison.

Analysis and interpretation of health data: As health data are affected by a multiplicity of causes, arrangement of the data in tabular form according to relevant factors is a first step in the understanding of the data. Mortality, fertility and morbidity data have all fundamental relationship with age and sex and therefore these are the two variables on which the basic tabulation is usually done. Other demographic variables like marital status, place of residence and density and socio-economic variables like educational level, economic status and environmental conditions also are important variables on which tabulation needs to be done for proper interpretation of health data. A number of vital statistical indices on fertility and mortality data have been devised to assist in the interpretation of the data tabulated this way.

The use of mathematical models to interpret health data:

There is considerable progress in the application of mathematical models to understand and interpret health data. Only one example is given which is from the field of Epidemiology. Under certain simple assumptions Reed and Frost showed that the no. of cases which occur in the $(+1)$ the time-interval and (t) the interval are connected by

the recurrence relation.

$c_{t+1} = s_t (1-l)^{c_t}$ where c_{t+1} is the no. of cases in the $t+1$ interval and s_t is the no. of susceptibles in the population in the interval and $l=1-p$ where p is defined as the probability of adequate contact between one individual and another in the population. This relationship has been found to be useful in explaining the progress & decline of an epidemic in a closed population. All epidemic diseases do not satisfy the conditions for the application of this model. Measle is one disease which fulfils most of the conditions for its application.

RELEVANT HEALTH AND NUTRITION EDUCATION*

by

J.P. Greaves and G. Donoso

The first point to make about education - any kind of education - is that it occurs always in a context. The context with which this paper is concerned is that of rural India, and the slums of the big cities - in other words, with over four fifths of the population. But the general content of the paper is applicable to most developing countries. The emphasis is on the poorer sections of the community, and on women and children. Why? Because this is where the need for health and nutrition education is the greatest, where it is the most urgent, and where success can bring the largest returns in terms of improved health and well-being.

The second point to make about education is that it must be relevant - relevant to the context in which it is given. It is necessary to examine the context a little more closely. India still has one of the highest infant and child mortality rates in the world: comparative estimates are, for infants below 12 months, 100 to 130 per 1000 live births; for children aged 1 to 4, 45 per 1000 children in the age group; corresponding figures for Western Europe or North America are 15 and 1 respectively. The reasons for this are well known: ignorance, often compounded with superstition about the nature and amounts of foods to be given to young children, coupled with an unsanitary environment in which infectious

* Based on a paper prepared for a Workshop on the Role of Home Science Colleges in Group Feeding Programmes, New Delhi, India; April 1976

diseases flourish, both nurtured by poverty. This leads to a mutually exacerbating syndrome of malnutrition and disease, especially diarrhoea and respiratory infections, which commonly ends in death. Large families, and especially closely spaced families, further aggravate the problem.

Health and nutrition education must be relevant to this context. It must, therefore, be concerned with the nature and amounts of foods to be given to young children, both in sickness and in health; with simple means of preventing and coping with infectious disease, and with the principles and practice of personal and environmental hygiene. Above all, it must be directed at correcting an attitude, a behavioural pattern, which is known to be of decisive importance in the genesis of malnutrition and associated infections. Education in this context should not be concerned to impart "knowledge" for its own sake; should not relate to "nutrition" generally; should not be directed to marginal or non-existent problems (for example, undue emphasis on fruit juices where there is no scurvy). Rather, it should be aimed to effect change in attitude and behaviour in areas known to be crucial to the development of malnutrition in the context in which it occurs. The messages to be imparted must be based on a sound knowledge of the local human ecology.

A vital point to apprehend is that, for the first two years of life, which is by far the most vulnerable period, the child is totally dependent on others - usually its mother - for what it is given to eat and drink. This point is so obvious that it deserves to be stressed. There is a

natural tendency to overlook the importance of a fact so simple. But this fact is the reason why the problem of malnutrition in this age group is unique. There is no way of circumventing the need - the essential need - to improve the understanding and practice of mothers in this regard. Older sisters, cousins, aunts are important too; nor should one forget the father. Perhaps the person with the greatest influence is the grandmother.

There are some who believe that economic progress alone will improve this situation. They are wrong. One does not have to point to the nutritional problems - of a very different kind - of affluent societies to substantiate the statement that they are wrong. There is evidence from Indian studies that the incidence of malnutrition in children under 2 is largely independent of the income of the family. Some argue, in the jargon of economics, that improvement in income is a necessary and sufficient condition for the elimination of malnutrition. But whatever be the real improvements, an increase in income may make to the diet of the family as a whole, it will have little effect on the child below 2 unless the mother's understanding of the child's needs is also improved. Nor is an increase in income always necessary: a redistribution of the family's available food so that the child below 2 gets an amount approaching its physiological need may make the difference between life and death to him, but only a marginal difference to the other family members.

To illustrate the relevance of context, one could turn to a situation in many respects the opposite of the one with which this paper deals: Britain in the seventies.

An article discussing what would be appropriate nutrition education for the mass of people in Britain today, where the major manifestation of malnutrition is obesity (especially disturbing in the young), concludes as follows: "... sensible eating for many people in Britain today implies an increase in consumption of fruits and vegetables and of bread (especially wholemeal bread); little change in consumption of milk, cheese and meat (but avoidance of their fat), and perhaps increased consumption of fish; and reduced consumption of fats and oils (except those rich in poly-unsaturated fatty acids which might even be increased) of sugar and sugar-containing foods (such as cakes, biscuits and pre-eminently sweets), and of alcoholic drinks. But above all, sensible eating implies moderate eating: restraint in the quantity, though not in the variety, of foods consumed."

Advice similar to this may indeed be appropriate for affluent India, but the number of people for whom it would be relevant, while in absolute terms far from negligible, represents in fact a relatively small proportion of the total population. For the mass of the people - the subject of this paper - quite different messages have to be conveyed.

Bearing in mind what has been said above about the preponderant Indian context, the following six groups of messages have a universal validity:

(i) Breast feed your child always and as long as possible. Remember, however, that from 4 months of age onwards he must receive extra food at least 4 times a day.

Keep in mind that the child depends on you to get the food he needs.

(ii) Feed your child only clean food and clean water, given with clean hands from clean utensils. Keep flies away from food.

(iii) Should your child fall ill, seek immediate help from available services. If diarrhoea (with or without vomiting) sets in, give your child immediately and repeatedly sugared water or weak tea. Diarrhoea can kill your baby because he loses more water than you give him. Try your best not to reduce his food intake.

(iv) Get your child immunized. Get your child weighed. Remember that an immunized child, who is growing well, is a healthy child.

(v) If you are expecting or nursing a child you should eat more, at least 4 times a day, with plenty of dark green or yellow vegetables. You need more food to produce a healthy baby or enough milk.

(vi) Two or three healthy children are enough. Space your children for your own and for their sake at intervals of 2 to 3 years. Remember that today you can have your children when you want.

The justification for these messages is briefly as follows:

Message 1 (a) Breast feeding is virtually universal in the rural setting but is starting to decline in the slum areas of the big cities. The breast feeding component of

this message will have to be emphasised or not according to the rural/urban environment. Recent work has confirmed that breast feeding does reduce the chances of conception: this in itself is an important reason for prolonging it.

(b) A low total calorie intake is at the very root of child malnutrition. Inadequately fed nursing mothers do not produce enough milk to fulfil the child's requirements for calories and protein from the 4th month onwards. There is much evidence to show that poor rates in growth, that eventually lead to malnutrition, become evident in a considerable number of children from the 3rd or 4th month of life. Supplementary feeding is essential, and should be done regularly in increasing amounts from the 4th month onwards. The extra amount of food needed cannot be got into the child in one or two meals: four times a day is probably adequate under village conditions.

(c) The young child is dependent on its mother for feeding, as emphasised above.

Message 2 Faecal contamination of food and consequent diarrhoea are nearly always associated with malnutrition. This message aims at preventing such contamination.

Message 3 (a) Health services offer only limited coverage in India. However, even if the services are available, people may not readily make use of them. The idea of making use of whatever health services are available should be a component of nutrition and health education.

(b) Diarrhoea is inextricably tied to malnutrition in children under 2 or 3 years of life. The treatment and

prevention of diarrhoea is very poorly understood by mothers and very inadequately handled through traditional practices and beliefs that emphasise prolonged restriction of both water and food. This wrong emphasis enhances the production of dehydration which is the main killer of the malnourished baby. Early oral rehydration can be a most effective tool in the control of dehydration due to diarrhoea in the malnourished child. Prolonged food restriction is in itself a mechanism in the production of malnutrition and all efforts should be made for an early normalisation of the diet in the child that is suffering from diarrhoea.

Message 4 (a) Infectious diseases such as tuberculosis, whooping cough, diphtheria and measles are very important contributory factors in malnutrition. By promoting immunization, we are in fact promoting better nutrition.

(b) By getting the child weighed at periodic intervals an early warning that the child is not progressing adequately, or that his nutritional condition is deteriorating, can be obtained and remedial action initiated.

Message 5 (a) Poorly nourished mothers will produce small babies of lower vitality and insufficient breast milk. Both factors conspire against good nutrition in the child. The number of meals per day is critical to the total amount of food intake of mothers, needed to fulfil their calorie requirements, and four meals per day should be considered a minimum for the nursing and expectant mother.

(b) Yellow and green vegetables in the diet of mothers are especially important where there is a problem

of xerophthalmia. In such areas the diet of children up to 5 years of age should also contain a supply of these vegetables.

Message 6 The more children in the family, the less food available per head. This can become critical for children under 2 or 3 years of age in families that have 4 or more children. The last-born is prone to malnutrition not only as a result of an insufficient diet after birth, but also through his mother during his intra-uterine development and growth. Spacing the children will promote a better nutritional status of the mother which will reflect persistently on that of the child she bears and nurses.

It is worth noting that none of the nutritional components of these messages - or, for that matter, of the ones considered relevant for Britain - makes specific mention of nutrients as such. There is no need to talk to people about protein, riboflavin or carotene; but there may be every need to encourage them to consume, for example, more dal, curd and drum-stick leaves, and to feed these, appropriately prepared, to their young children. It is absurd to talk about milligrams of this or that vitamin; sensible to talk about homely measures of this or that food. It is doubtful if it is very useful to talk in terms of groups of foods, as is conventionally done in a number of "systems": foods have been classified in 3, 4, 5 or as many as 9 different "groups", with exhortations about including examples from every group in each meal. More useful to start by observing habitual practice; note what is good in this, and emphasise it; and then suggest practical and quite specific ways in which

practice can be improved - for example, about age at which semi-solids and solid foods are introduced, about ways in which foods are prepared, about frequency of feeding, and about particular foods that are (or could become) readily available and could be used to supplement the diet. No point in lauding the virtues of eggs if these are beyond the economic means of those one is attempting to help! No point in demonstrating how vegetables and fruits may be conserved with the aid of a pressure cooker and Kilner jars if these represent wealth beyond the dreams of avarice! (These and other examples in this paper, of inappropriate - i.e. irrelevant - education are not figments of the imagination: all have been observed in the field).

What is being advocated is simply the translation of the six universal groups of messages into practical and quite specific advice, relevant to each situation. "Extra food", and "dark green or yellow vegetables", means something different in South India to what it does in North India. Or in Africa. What is the local cereal? What are the pulses or oilseeds locally available? How can these best be prepared for young children? How much, and how often, can they be fed? Which green or yellow vegetables are already available, or could be grown in so-called kitchen or community gardens? How should they be prepared and included in the diet? What are the unusual but often nutritionally valuable food supplements that commonly feature in the diets of tribals, and consumption of which should be encouraged - and perhaps introduced in larger quantities, at an earlier age than tradition dictates? What is the local source of water,

and how can it be made more "clean" for drinking? Given the economic circumstances of the people, the local availability and price of foods, the nature of food supplements that may be available (for example, from a food-for-work programme), what is the wisest pattern of food expenditure?

The answers to such questions clearly call for homework on the part of the would-be health and nutrition educators - or, to give it a more pompous term, research. Research has been defined as, firstly, the identification of a problem, and secondly, the search for a solution. Relevant problems can only be identified by studying the life of the people, not the literature of fellow-workers. Colleges of Home Science, amongst other institutions, are in principle well equipped for such research. Research of this kind is just as intellectually demanding as the more academic kind, and often very much more useful. It requires a certain humility on the part of the workers - they **should** not project their own problems (for example with respect to hang-ups about breast feeding), but enter sympathetically into those - recognised or not - of the people. Such research must recognise that solutions to problems, if they are to be effective, must be simple - and simplicity to the pseudo-sophisticated is suspect. It must be concerned not only with the messages to be conveyed, but equally with the means by which they are to be communicated. It requires persistent monitoring - or follow-up - to ensure that relevance is maintained. And finally it requires a constant concern for application of its results, and the recognition

that this can be only fully achieved at second-hand: that success can only be realised if local community workers are trained to deliver the messages, with the Home Science College or other Training Institutions acting as an authoritative resource, stimulus and guide.

All those involved should constantly remember that their objective should be to promote relevant changes in behaviour, and that success, if it is to endure, will depend on a conviction by the people that they "have done it themselves". Lao-tzu, a Chinese philosopher, wrote thus about leadership more than 2500 years ago:

"Of the best leaders
the people only know that they exist:
The next best they love and praise;
the next they fear;
And the next they revile,
When they do not command the people's trust,
Some will lose faith in them,
And then they resort to recriminations!
But of the best, when their task is accomplished,
their work done,
The people all remark, 'We have done it Ourselves!'"

SPECIFIC STUDIES
RATIONALE OF TOXICITY
and
ROLE OF OCCUPATIONAL HEALTH SERVICES IN RESEARCH

by

Mr. N.R. Ananthakrishnan, Mr. S.N. Karthikeyan
& Dr. C.K. Ramchandrar

This paper is based on our experience of formulating insecticides and herbicides for over twenty years and marketing them for nearly twenty five years in Peninsular India. We focus in this presentation the toxicological hazards of handling of technicals, formulations of intermediaries and final products, their packaging, and distribution.

One of the authors (Dr. C.K. Ramchandrar) has been advisor to many Medical Practitioners and Hospitals in this area, whenever they encountered medical problems due to pesticide toxicity.

The occupation in which most of the Asians are involved as a profession or hobby is plant cultivation -- agriculture, horticulture or gardening. In protecting their plants, over 80% of Asians, are exposed to "Protecting Agents". These, meant to achieve total mortality among insects, do cause varying degrees of morbidity in Homo sapiens.

The 80% of Indians involved in different formulating hazards could be classified as under :

(a) Manufacturing establishments	1%
(b) As approved formulating factories	2%
(c) As small-scale formulating industry (stated to be over 200 in number)	3%
(d) As sub-contractors to (a), (b), (c)	9%
(e) As enlightened farmers	20%
(f) As illiterate agriculturists	35%
(g) As amateur gardeners	10%

At a modest figure of 400 million of Indians, in the working age group, the number thus involved is significant, if not staggering.

To be able to pragmatically plan specific studies in pesticides toxicity, we need to be clear in our mind as to what is toxicity in human beings. The presence in infinitesimal amounts of pesticides in the body is not to be taken as toxicity due to pesticide.

As a basis of pesticide toxicological studies, it is relevant and useful to recapitulate the present concept of toxic effects due to pesticides.

Standards to limit exposure to hazardous chemicals are established to prevent the development of specific diseases and to guard against their possible contribution in a secondary way to the onset, progression, or severity of chronic degenerative diseases or other illness. This normally provides for the full span of normal life and covers the less resistant as well as the more robust persons. The objective is to limit the levels of exposure and other

conditions of contact with hazardous agents so that the persons will experience, through the years, no significant loss of health attributable to pesticide exposure.

The criteria that properly determines the dividing line between permissible exposure and an exposure that carries with it significant threat to health, is not easy to determine, since the objective is to limit the exposure's immediate trouble. It is clear that the mere absence of illness or lack of pre-clinical signs of impending illness will not constitute sufficient evidence of adequate health protection. The cut off in exposure must be fixed to keep the day-to-day response far below such obvious signs of injury to ensure a necessary reserve of safety to allow for the remaining years of exposure, during one's normal working life. The negative deviation of health must be selected to mark a point of change in the state of health, which is the first significant indicator of possible ill-health in the future. This point is substantially below the beginning of disease and is, no doubt, also situated some distance above a wholly undisturbed state of health.

There are available, today, many methods for detecting and measuring the degree of impairment caused by hazardous substances. These methods have developed recently at a rate that has considerably exceeded the advancement of understanding of their meaning as indicators of significant change in health. As a result of this development in recognition of the need to provide adequate factors of safety in the face of many unknowns in the dose-response relationships, there

has been rather uncritical tendency by some to interpret demonstrated biological response of whatever kind and intensity, as evidence of impending loss of health and, in the extreme, to regard ^{the response} ~~itself~~ as direct expression or injury. Others go even further and look upon any measured concentration of the offending agent in body tissues, however low, as evidence of excessive exposure and confuse the mere presence of the substance in the body with an actual threat to health.

Occupational health experts in the USSR, in contrast, have set a dividing line between health and potential ill-health at the point of earliest change from the normal physiological behaviour exhibited by healthy animals prior to exposures. These opposing points of view have led to striking differences in recommended levels of permissible exposure to the hazardous agents commonly of tenfold and even 50-fold magnitude. Final validation can come only from actual long term health records of exposed persons.

It is known, that the dose range, over which all members of an exposed group respond, can differ remarkably from one pesticide to another, depending upon the nature of the toxic action of body responses and on the kind of response used as the critical indicator. A population of normal, healthy individuals may, because of genetic, socio-economic or other distinguishing characteristics, show a wider range of susceptibility than another.

Here lies the danger to transfer of American and European pesticide toxicological findings to India, where genetic and socioeconomic factors are different. We need to

carryout specific studies in India, on the toxicological effect of pesticides. Even in India, what is safe for six footed hefty Punjabi, may be dangerous for the 4½ foot Telengana famished farmer.

Initially, we could do these studies with what can be achieved with some supplanting of existing established facilities, in terms of medical and research facilities.

There are in India, some pesticides raw materials, intermediaries, concentrates, manufacturing factories and many formulating establishments. Some of them have a well organized basic health service.

It would be pragmatic to base pesticide toxicological studies in them. They need planning, design for research, statistically significant sampling, defendable biochemical and hematological facilities, and scientifically acceptable interpretation of the data. This is not available in every unit identified above.

To achieve this, the Pesticides Association of India could set up an Apex Toxicological Investigation Committee, the membership of which is to include specialist in documentation, who could wade through all published work, analyse them and make relevant data available to others; Laboratory based Research scientists, who could plan animal experiments and make available their findings, Industrial Hygienists who could determine pollution levels.

Armed with all these knowledge, information and data, Occupational Health Physician-members of the Committee in plant protection materials manufacturing and formulating

factories, could monitor on a long term basis the health status of workers in these establishments on the lines discussed earlier for acute toxicity and chronic morbidity. Where these establishments are in semi-rural area, they could also include in their research programme, agricultural workers in nearby areas. An example of this set up is the medical service of a sugar factory overseeing the health of the cane ryots of their area. Yet another example is the tea gardens, where a captive population and a good medical service are available. These suggestions are offered to harness existing capacity for research and to avoid duplication of setting up medical infrastructure.

But we must caution, that most of those medical services have not research expertise, or training and much loss equipment. But they have an invaluable asset. They have the acceptance of the persons to be medically evaluated, and communication between research and the subject would be truthful.

The Pesticides Association of India, could direct the apex body referred to earlier to plan, guide and fund on an all India basis, these in our country to ensure full utilization of existing facilities, and avoidance of reduplication.

Certain special projects may be of interest to the Indian Council of Agricultural Research and Indian Council of Medical Research and also similar bodies. Government of India National Committee on Environmental Planning and Co-ordination, could be persuaded to be interested in these Research Projects. The possibility of Pesticide Association inviting

them to participate in this national endeavour could be explored.

In determining priorities, it is suggested a few pesticides, that are used to a large extent in India, be taken up for study first, in addition to few that are known to be at high toxicity.

In all these research projects, it is necessary to involve the industry fully. They have good established laboratories, much sophisticated equipment and highly qualified scientists. They have a stake in the findings of these research projects.

There is considerable person to person variation in pesticide toxicity due to individual variation in dynamics and metabolism of pesticides. I am aware of some excellent field studies by Indian Council of Agricultural Research, New Delhi and National Institute of Occupational Health, Ahmedabad as also laboratory based research of a very high order at the Institute of Toxicology, Lucknow. But longitudinal studies in a captive population are not obvious.

Our suggestions are based on our own experience in our Occupational Health Service of quarter of a century in a pesticide formulation plant. We have done periodical biochemical and hamatological examinations, pulmonary function tests, X-ray examination and taking all these into account, clinical examinations. We have also studied total absence of the workers, including sickness abstention, as in our country in general and where E.S.I.S. medical arrangements exist in

particular, sickness absence records on their own, do not reveal the true picture.

The ideal standard could be that even the chronically ill senior citizen and neonatal infant are not adversely affected. In our present state of economy, where effective pesticides are an imperative need for providing food for millions, these group could be cautioned to keep of pesticides, and realistic achievable standards indicated.

Many toxicological mishaps happen when the farmer uses the pesticides in India, the only way a farmer is "given" guidance and instruction, in safe handling of pesticides is by the printed literature in and on the packages and sales talk of marketing personnel. There is need for specific research in this area of potential danger. Mass communication experts and behavioural scientists must be mobilised to study the adequacy of printed communication in an illiterate population, and behavioural pattern of the average farmer in handling pesticides. I commend this to our marketing colleagues.

The role of sensible handling of pesticides and of proper protective equipment, in accepting more toxic and hence more effective pesticides, needs specific studies. These could be based on personal of farm spraying companies, who contract to do this work. Being organised labour, dependable long term studies on the effective role of protective equipment, that can be comfortably used in field working conditions, in tropical climate could be studied.

SPECIFIC STUDY

1. Need based - study Pesticides most used in India and the most toxic.
2. Rationally determine toxic levels also for our country.
3. Utilize occupational health services in factories where raw materials, intermediaries, and formulations of pesticides are manufactured for long term studies.
4. Invite and involve the pesticide industry in these projects.
5. Evaluate the utility of personal protective equipment in toxicity hazard presentation.

In pesticide toxicology the alarmist should be argued out, the apprehensive is to be reasoned into, and the alert is to be appreciated.

sr

REFRESHER COURSE FOR PLANTATION MEDICAL OFFICERS

(25.4.1977 - 7.5.1977)

List of Participants

S.No.	Name of participant and address	Deputed from -
1.	Dr. S. Ratnam, L.I.M. Group Medical Officer, Sentinel Rock Estate, Vellarmalla P.O., South Wynaad.(Kerala)	- Malayalam Plantations
2.	Dr. Viswanathan Magapu, MBBS, Medical Officer, Kadamane Estate, Kadamane P.O., Hassan Dist., (Karnataka State)	- Kadamane Estates Co.
3.	Dr. S. Mahalingam, MBBS., Medical Officer, Mudis Garden Hospital, Mudis P.O., Coimbatore District.	- Bombay Burmah Trading Corporation Ltd.
4.	Dr. P.C. Alexander, Medical Officer, Glenlorna Estate, Hudikeri P.O., South Coorg.	- Coorg Tea Co. Ltd.
5.	Dr. Maria Alberoni, MBBS., Medical Superintendent, Good Shepherd Hospital, Wayithiri P.O., Wynaad, Kerala State.	- Chellottee Estate
6.	Dr. G.Rajamanickam, MBBS., Medical Officer, M.K. Hospital, Mooply Estate, Palapilly P.O., Kerala State.	- Malayalam Plantations

S.No.	Name of participant and address	Deputed from -
7.	Dr. P.V. Sankaranarayanan, MBBS., Medical Officer, Achoor Estate, Achooranam P.O., South Wynaad. (Kerala)	- Malayalam Plantations
8.	Dr. T.T. Zacharia, MBBS., J.H.A.O., Dymock P.O., Vandiperiyar, Kerala State.	- Vandiperiyar Group Medical Scheme
9.	Dr. P.S. Herbert, M.D.(Rome), Wentworth Estate Hospital, Cherambadi P.O., The Nilgiris District.	- Malayalam Plantations
10.	Dr. Oommen Abraham, MBBS., Joint Health Advisory Officer, Moopenad Central Hospital, MEPPADI P.O., Kerala State.	- Malayalam Plantations
11.	Dr. R. Raja Mariasoosai MBBS., Group Medical Officer, Chittavurrai Estate, ELLAPATTI P.O., Kerala State.	- K.D.H.P. Co. Ltd.
12.	Dr. V.J. Thomas, MBBS., Group Medical Officer, V.V.M.S. Hospital, KALTHURITTY P.O., Kerala.	- Venture Valley Medical Scheme
13.	Dr. E. Frederick, MBBS., DHO., Chief Medical Officer, Valparai Estate, VALPARAI P.O., Coimbatore District.	- A.A.D.T.T.Co. Ltd.

S.No.	Name of participant and address	Deputed from -
14.	Dr.M.R. Bhaskara Menon, MBBS., Group Medical Officer, Central Hospital, SURIANALLE P.O., Kerala State.	- Malayalam Plantations
15.	Dr. C. John Philip, MBBS., Medical Officer, Iyerpadi Hospital, IYERPADI P.O., Via. Pollachi.	- Co-opt. Wholesale Society Ltd.
16.	Dr. K. Srinivasan Pothi, MBBS., Medical Officer, UPASI CLWS, "Glenview", COONOOR-1. The Nilgiris.	- UPASI CLWS
17.	Dr. (Mrs.) D. Kaivalya, MBBS., Karamalai Tea Estate, KARAMALAI BAZAAR P.O., Coimbatore District.	- Karamalai Tea and Produce Co. Ltd.
18.	Dr. (Mrs.) Mary Joseph MBBS., Medical Officer, UPASI CLWS., Velonie Estate, VALPARAI P.O., Coimbatore District.	- UPASI CLWS
19.	Dr. K.S. Venkatachalam MBBS., Group Medical Officer, High Wavys Garden Hospital, HIGH WAVYS P.O., Madurai District.	- Tea Estates India Pvt. Ltd.
20.	Dr. B.S. Ramakrishniah, MBBS., F.C.G.P., Group Medical Officer, DEVARSHOLA P.O., (Daverashola Garden Hospital), Nilgiris.	- do -
21.	Dr. P. Benjamin, MBBS., Chief Medical Officer, Stanmore Garden Hospital, VALPARAI P.O., Coimbatore District.	- do -

S.No.	Name of participant and address	Deputed from -
22.	Dr. S. Muthuswamy, MBBS., Medical Officer, Waterfall Estate, Via Pollachi, Coimbatore District.	- Kothari (Madras) Ltd.
23.	Dr. T.R. Basavaraj, Santawerry Estate-West, SANTAVERI P.O., Chikmagalur District.	- Kothari (Madras) Ltd.
24.	Dr. Shetty, N.R., Medical Officer, Alageswar Estate, JAYAPURA P.O., Chikmagalur District.	- Alageswar Estates Ltd.
25.	Dr. C.G. Rajasingh, MBBS., Sholayar Estate, SHOLAYAR P.O., Coimbatore District.	- Jay Shree Tea & Industries Ltd.

pss:sr

COMMUNITY HEALTH CELL

326, V Main, I Block

Koramangala

Bangalore-560034

India

